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CENTRAL CALIFORNIA GAS COMPANY'S SYSTEM.

BY RUDOLPH W. VAN NORDEN.

THE DISTRICT AGENT.

BY W. R. NEELANDS.

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BY JOHN WILLIAMS DAVIS.

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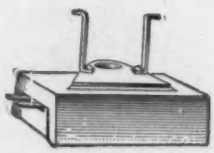
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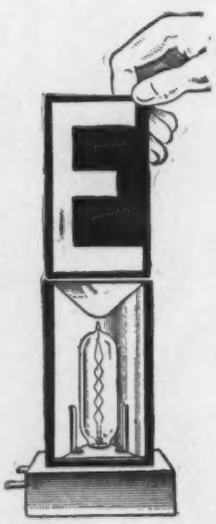
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VOLUME XXXI SAN FRANCISCO, NOVEMBER 29, 1913 NUMBER 22

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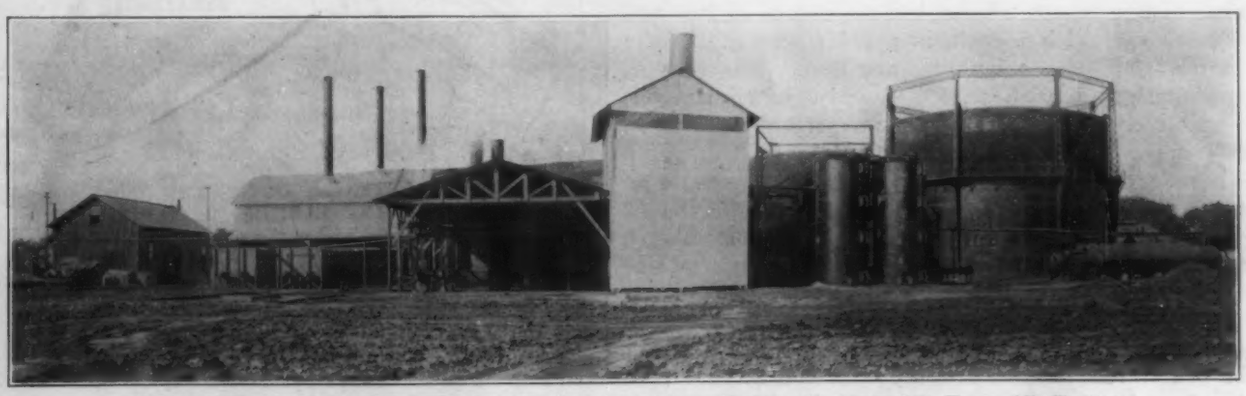
CENTRAL CALIFORNIA GAS COMPANY'S SYSTEM

BY RUDOLPH W. VAN NORDEN.

A system of gas transmission, modern, efficient and interesting, is in operation throughout the more populous part of Tulare county, one of the largest and richest of California's counties. This, the system of the Central California Gas Company, is primarily a consolidation of two widely separated installations, conventional in their kind, similar to many small plants which may be found operating in small ways in small cities—perfectly good and serviceable from the conventional standard. The most important consideration for the new organization was the possibility of enlarging so as to supply gas to those entirely beyond the scope, physically or economically, of the old nucleal systems. To spread out upon the basis of methods and operation costs of the old plants would have invited failure. To spread out successfully required a move along new lines, a study of plant economics along every line, proper plant design for low cost of operation, centralization of plant operation, modern simplified methods of business control, a desire to give to the public all that it possibly can and a flexibility of system which can anticipate a rapid growth by being able to meet this growth easily and efficiently.

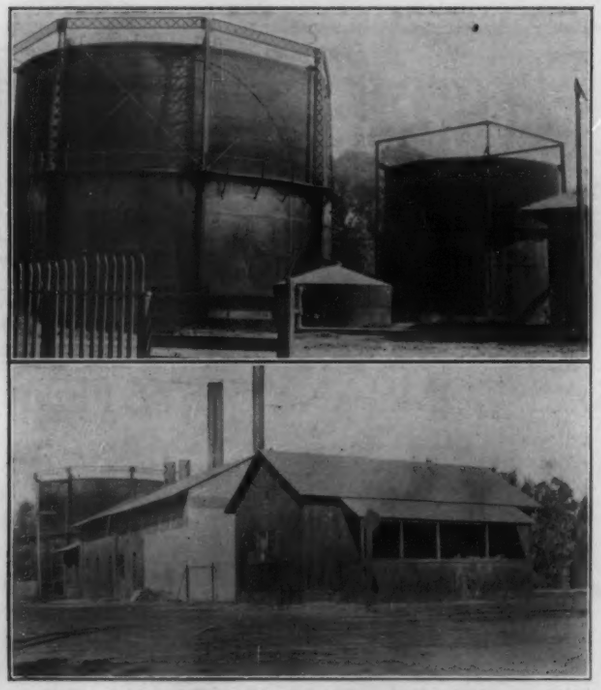
The Central California Gas Company was organized in 1912 to purchase the Home Gas Company of Porterville, and the Consolidated Heat, Light & Power Company of Visalia and Tulare, and with the intention of connecting these plants, through a transmission pipe line and incidentally to supply the intervening towns. All of the acts of this company have been strictly under the supervision of the railroad commission of California and it is interesting to note that the application for a certificate of public convenience and necessity requiring the exercising of a franchise in Lindsay, was No. 1, the first certificate issued under the law by this commission. Following this there have been other certificates and orders issued by the commission, amounting to nine in all. These authorized the purchase of the gas systems in Porterville and Visalia, the franchise in Exeter, Lindsay and Porterville and all of Tulare county outside of incorporated limits, for the transmission line, and for the right to issue bonds.

Visalia is the county seat of Tulare county, well laid out with wide well paved streets, many substantial business houses, beautiful homes and an undeniable air of prosperity. The city has a population of 6,000 and is served by both the Southern Pacific, the Atchison, Topeka & Santa Fe, and an interurban electric railway. The plant of the Consolidated, Heat, Light & Power Company in this city was selected, both from its location, the cost of fuel and its possibilities, as the site for a central plant from which all



General View of Central Gas Plant at Visalia. This View Shows All Apparatus From Oil Storage Tanks on the Left to Outgoing Pipe Lines on the Right.

points in the county to be supplied with gas service should radiate. The purchase of this plant included a transmission pipe line to the city of Tulare where gas was being distributed.



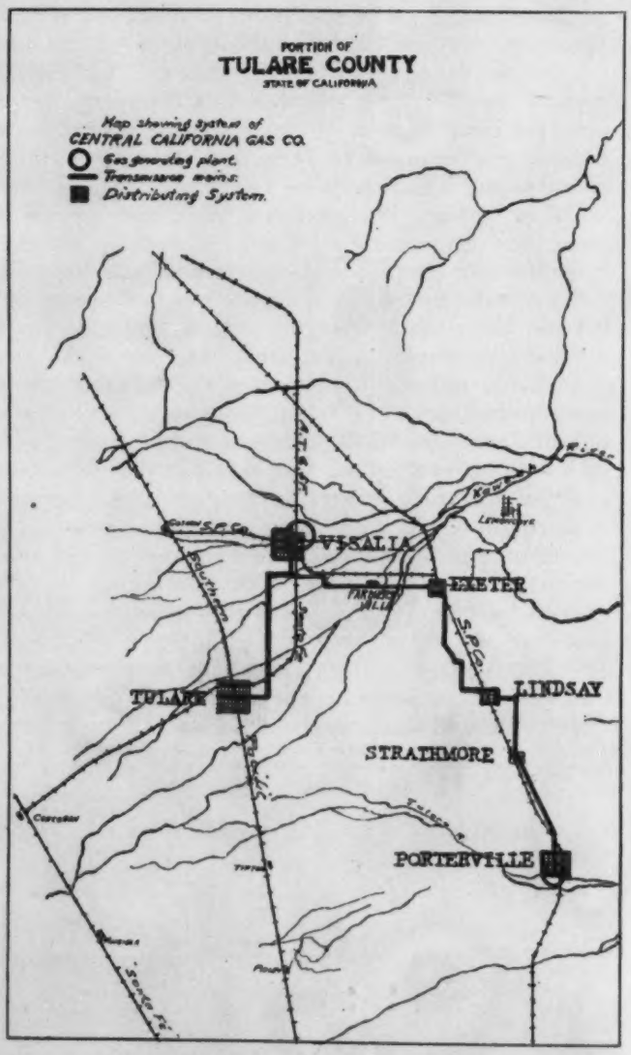
Gas Holders and Tight Box Purifier.
View of Plant From Street.

The Central Generating Plant.

The new plant in Visalia is situated on the property acquired from the former company and employs in its operation as much of the older equipment as is compatible with the proper operation of a much larger service along economic lines very much improved. It covers a city block and has an area of 1½ acres. Of this, about one-half is occupied by the present plant, which allows for enlargements and extensions in a thoroughly pre-arranged plan of construction, as the demand for gas shall increase.

The older installation is housed in a brick building 50 ft. x 32 ft. and this with its contents stands practically unchanged, its roof forming a part of the general roof covering of the plant. Its front wall is on the street and property line.

The apparatus installed in the older system, consists of two return tubular boilers, one of 35 h.p. and the other of 50 h.p. each, in a brick setting. In the central part of the building are two Western type, crude-oil gas generators, 4½ ft. and 6 ft. in diameter, respectively, and 14 ft. high; two superheaters, one 4 ft. and the other 4½ ft. diameter and 17 ft. 9 in. high. These gas machines are so arranged to connect to a common wash box. This has a vertical cylinder 4 ft. high and 6 ft. diameter and is supported on a steel frame 6 ft. above the floor level. In the rear of the wash box are two scrubbers, each 4 ft. diameter and 14 ft. high. These machines have a combined capacity of 28,000 cu. ft. of gas per hour, and are kept in order, ready for emergency service although so far there has been no call upon them. The Western type of machine is much in use on the Pacific Coast and where crude oil is used as a gas making fuel. The service of the new company contemplated a use of gas far in excess of the capacity of these machines and the design of the new plant along lines of better economy necessitated the disuse of this apparatus except for emergency. For this reason the operating connection with the new system has been maintained. Adjoining the room containing the generators and auxiliaries just described, is a small room in which are placed two steam driven compressors and two blowers. The compressors were originally installed to raise the holder pressure to the transmission pressure for delivery both in Visalia and to Tulare. One of these is a Laidlaw-Dunn-Gordon, steam and air type; size of cylinders 10 in. x 12 in. x 10 in. stroke. The other is a Simplex of practically the same type with cylinders 9 in. x 10 in. x 12 in. stroke. Of the blowers, both are Sturtevant, the one No. 4 and the other No. 5, the first is belt driven by a "Climax" 15 h.p. simple horizontal steam engine, while the other is belt driven by a "Jewell No. 3" engine of similar rating and type. In a shed north of this room are



placed two wooden box purifiers. These are 10½ ft. long by 8½ ft. wide and 5 ft. deep, with sheet steel covers. They are equipped with a center wet seal for operation and wet lute. The combined capacity of these purifiers is 30,000 cu. ft. per hour.

Holders.

Placed to the north of the gas house are two single lift Stacy steel tank Eastern type gas holders, both of which were a part of the old plant equipment. The smaller of these holders has a capacity of 10,000 cu. ft.; this has an outside diameter of 27 ft. The larger of the holders has a diameter of 60 ft., and a capacity of 50,000 cu. ft.

The oil and water pump equipment of the older installation is in use in the new installation and will be described in that connection.

The method of lampblack disposal has been entirely remodeled, while the fuel oil tanks have been enlarged and improved for a heavier service.

Of the older installation described, the gas machines and scrubbers, blowers and compressors are not in regular use, but the purifiers, holders, boilers and pumps and some of the old piping are.

New Installation.

In the design of the new installation, it was planned to arrange all apparatus so that operations would be in sequence; to afford a minimum amount of handling and manual labor; to insure the greatest simplicity in plant construction; the utmost safety in operation by removing so far as might be possible weak or obscure points in the system. In carrying out this idea, the entire street frontage was put to use as a basis from which to gradually spread the plant across the property.

Beginning with the corner and adjoining the railway is a building 42 ft. x 24 ft. which is divided into two compartments. The larger of these is a warehouse in which all supplies for the physical maintenance, repair and extension of the system are kept. Shelves and bins properly classified make possible a checking system by which all material incoming and outgoing may be indexed. In the other compartment is the meter testing, repairing and storage department. This is equipped with bench and tools and a meter prover used in the work of testing and adjusting service meters. On the railroad side of this building is a platform, while on the other side is a loading platform, the driveway into the plant entering between this building and the boiler house.

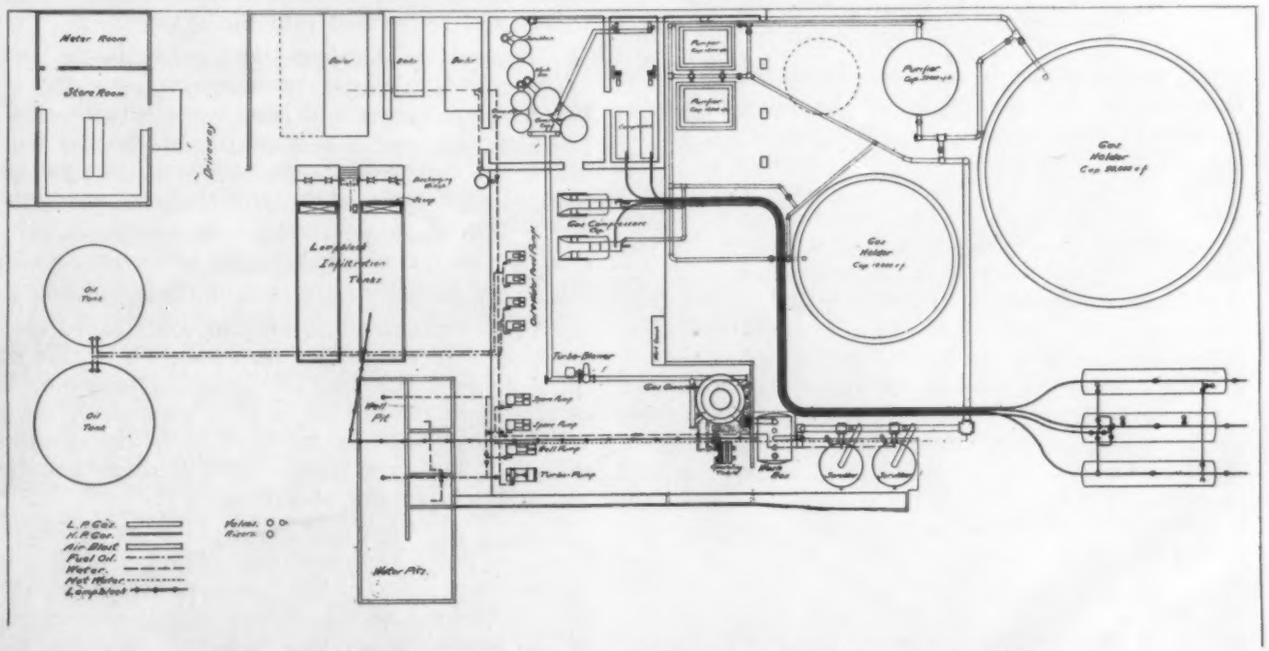
Next to the warehouse and also adjacent to the railway are the fuel oil tanks. There are two of these built of concrete, the bases being brick upon which is laid a floor of concrete. The first tank has a diameter of 21 ft., and a depth of 8 ft. 10 in., and its capacity is 25,000 gal. This tank has a concrete cover. The second tank has a diameter of 30 ft. 8 in. and the depth is 11 ft. The capacity is 50,000 gal. The cover of this tank is conical, built of wood and covered with tarred building paper. Oil is delivered directly into the tanks by gravity from cars which are spotted on the railroad siding. The outlet piping and valves are above ground permitting accessibility and easy inspection.

Beyond the oil tanks and adjoining the railway right of way is a corrugated iron lavatory and bath house 16 x 20 ft. This feature, so carelessly overlooked in many older plants, has proven to be of the greatest importance to the welfare of the operators and is thoroughly appreciated. Aside from ample lavatory and toilet arrangements there is a hot and cold shower bath and sanitary lockers are provided for all employes.

It will be observed that the placing of the warehouse is such that incoming and outgoing materials may be handled without carrying into the plant and hence without interfering with or being in the way of other operations. The lavatory building is also so placed that it is reached without entering the plant proper, and upon leaving, after an employe has cleaned up and changed his clothes, it is not necessary to pass through any part of the plant.

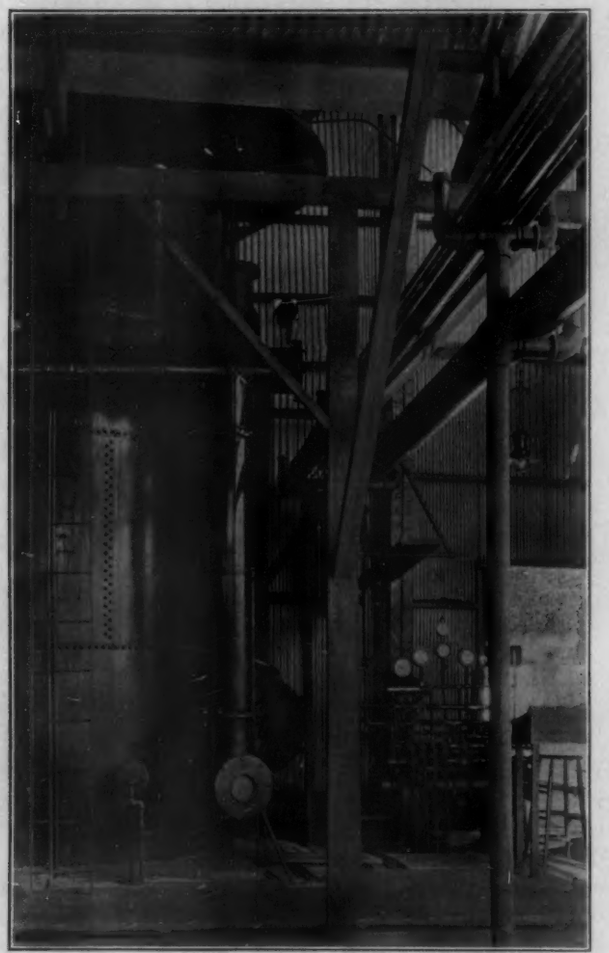
Boilers.

The space between the driveway and the old boiler installation being sufficient, has been used as a continuation of the boiler room within which to place two new boiler units. Of these one has been



Plan of Plant Layout, Showing Principal Oil, Water, Air, Lampblack and Gas Piping.

installed. This boiler has a rating of 100 h.p.; it is of the return tubular type and was furnished by the Baker Iron Works of Los Angeles. This boiler has a brick setting with one side finished so that the second boiler may be placed directly against it. The extension of the boiler house building is of galvanized



The "Straight Shot" Gas Generator and Operating Table. Hot and Cold Water and Oil Supply Pipes and (Lower) Lampblack Conveyer Pipe, on Elevated Pipe Frame.

corrugated iron and is open on the plant side. The three boilers, including those of the old installation, are now in constant use. All are equipped for oil firing and have Anderson crude oil burners, all of which receive their supply through a heater from steam driven fuel oil pumps. The furnaces under all of the boilers are equipped with grates upon which the lamp black by-product from the manufacture of gas is consumed and which furnishes a part of the heat necessary in the generation of steam from the boilers. It is necessary in using lampblack as a fuel to supply a certain amount of crude oil fuel which serves to coke the lampblack. It would not be possible to burn the lampblack without this assistance. A relatively small amount of fuel oil is required, but as the fuel requirement is in excess of the lampblack production, it becomes necessary at times to augment this deficiency by an increased consumption of oil. The method of handling the lampblack is unique and forms one of the notable and interesting features of this plant. A detailed description of the apparatus and its operation is given later in this article.

The New Generating Plant.

Following a carefully pre-arranged plan for enlargement upon simple lines, to at all times allow of economic operation, the new generating plant has been placed well back from the old plant building toward the center of the property. A concrete operating floor was laid slightly above ground level, to allow for drainage. This floor covers a space 38 ft. wide, thus coinciding with the length of the old brick gas house. It extends toward the center of the lot 66 ft., and its entire area is given up to the pumps, compressors and blowers. Over the operating floor is a corrugated iron roof, supported on simple wooden trusses which in turn are carried by wooden columns at the sides, but otherwise this operating space is not housed. The climate of the San Joaquin valley is such that for most of the year an open operating space is desirable to the comfort of employes and to cleanliness and ease in operation. During the rainy months when there may be experienced some cold weather, the climate is never rigorous enough to interfere with ordinary operation, as there is sufficient waste heat generated about the plant to provide for the comfort of the operators. At the rear end and to one side of the operating platform is the gas generator and operating table. The space occupied by these machines is roofed over and also enclosed, although it is open to the operating platform. Directly behind the generator building, but without protection of any sort, is the wash box, followed by two scrubbers. Under all of this apparatus is a heavy concrete floor laid directly on the ground, there being a low concrete barrier at the edges of the concrete floor and surrounding each piece of apparatus. This is for the purpose of collecting water from or about the apparatus and drain it into a concrete canal. The canal, which is formed out of the concrete of the floor, is open, has a width of from 3 to 4 ft. and extends from the further scrubber along the edge of the concrete floor, passing within the generator room and along the back edge of the operating floor, emptying finally into the water pits from whence it may be cooled and re-pumped into the system.

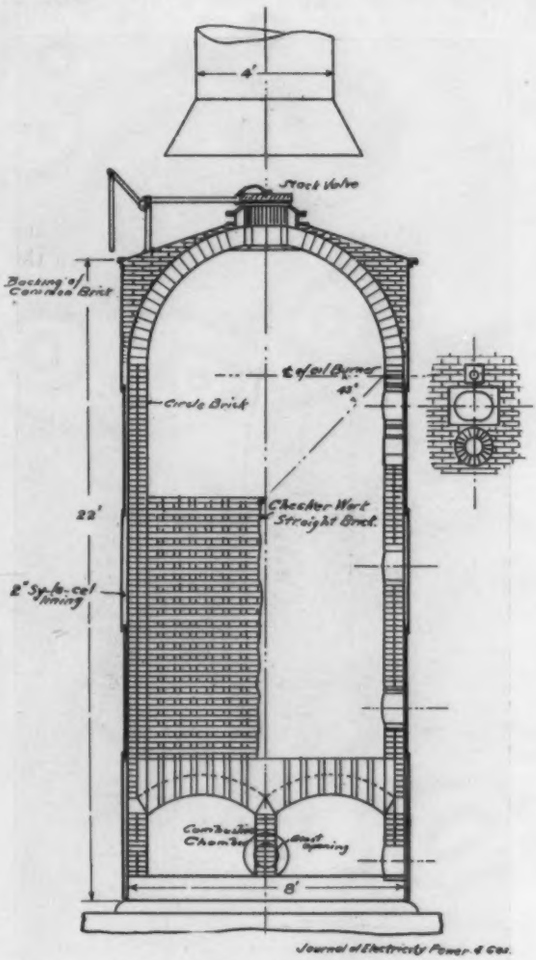
Beyond the scrubbers and conveniently located with respect to piping arrangements, are the three line pressure tanks, and in a space between the old plant purifiers and the larger of the two gas holders are to be two purifiers of 50,000 cu. ft. per hour capacity each, one of these purifiers being now in place and in use.

Generator.

The principal apparatus in the equipment of a gas plant is the generator, more commonly called the gas machine. On the design and operation of this apparatus depends the first and principal economic duty of the plant, the quality and constitution of the gas, and its operation has much to do in the determination of the style and design of the auxiliary apparatus, its arrangement and operation.

Much has been said and written of the improvement and duty of gas machines where crude oil is used for fuel, especially on the Pacific Coast and there are those who have been identified with the development of the gas manufacturing industry, who will easily rank as the leaders in this vast branch of public serv-

ice enterprise. There is, however, as in most branches of industrial research, a division of opinion as to economic methods of product manufacture, where there are many points favored by authorities of either side. This condition holds true to a certain extent in the gas making field.



Cross Section of Straight-Shot Gas Generator.

Two general types of gas generator may be ordinarily found in gas plants on the Pacific Coast, the one, known as the Western type, which has been developed with especial reference to the use of crude oil fuel and which is the most generally in use, while the other an adaptation of Eastern practice for the use of crude oil fuel, commonly known as the "Straight shot," machine. The first of these generators is in two parts, each generally a vertical cylinder in which the first is a combustion chamber in the lower part of which is a checker work of firebrick. The second part connected to the first across the bottom of both cylinders, contains only checker work with an outlet at the top; this cylinder is called the superheater. The operation of gas making consists in first heating the checker work in both cylinders from an oil flame and air blast in the combustion chamber of the first cylinder, the product of combustion passing through a valve into a stack from the opening in the top of the second cylinder. When the checker work is heated to a proper temperature, the stack valve is closed. This has the effect of closing the machine. The blast of air is stopped and the oil is injected as before into the combustion chamber where it is immediately vaporized, but is not ignited, as the generator is closed and has no air supply and so does not provide the requisites for combustion. The outlet valve is now opened into the outlet pipe to the wash box. Vapor formed in the combustion chamber passes through the heated checker work where it is "cracked" or broken up into its chemical constituents, the lighter hydrocarbons forming lampblack. These products pass over into the superheater and the operation of cracking is completed while passing through the checker work in this part, care being taken not to over-heat the gases at the end of the operation, causing a further chemical breaking up and changing the desired quality of the resulting gas.

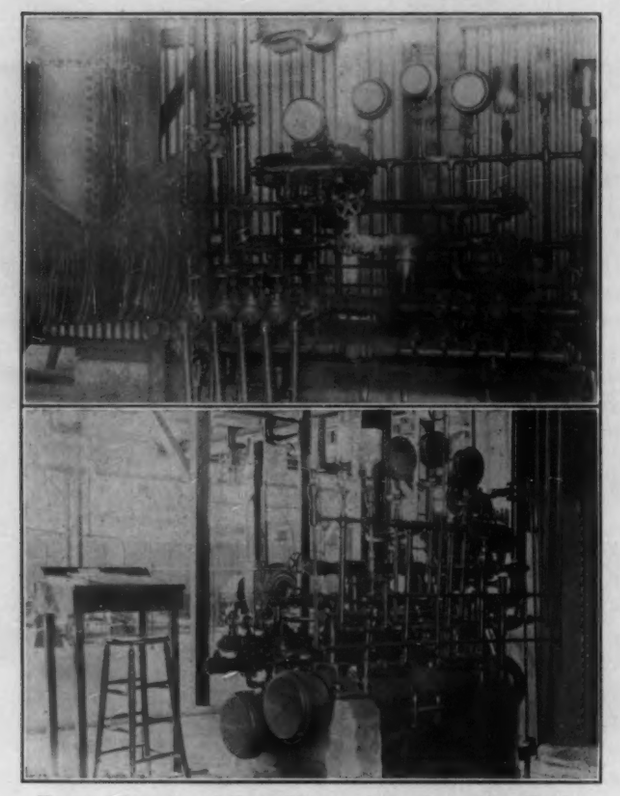
The "straight shot" generator accomplishes the same result but it is done in a single cylinder and the "blasting" and "making" operations occur at opposite ends and in opposite directions. The generator consists of a sheet steel casing within which is a double lining of fire resisting brick. The combustion chamber is at the bottom, oil-burners being introduced at one or more points around the side of the chamber. The combustion chamber is arched over with a perforated fire brick on which is supported a checker work of fire brick extending well toward the upper end of the generator. Above this is the vaporizing chamber or carburetter and through the walls of the machine into this chamber are introduced the oil nozzles for vaporizing the gas making fuel. Above this chamber is a stack opening into which is introduced a "stack-valve." In operation the first act is the blasting, when the combustion of the oil at the lower burners assisted by a powerful blast of air, passes upward through the checker work and out of the stack valve. This heats the checker work to the desired temperature for gas making. After blasting for a certain time, the oil flow and air blast are shut off, and the stack valve is closed, making the generator air tight. The oil supply at the upper end is now turned on and the vapor formed passes down through the hot checker work where it is cracked, into the combustion chamber and then out through the gas outlet pipe to the wash box, the only means of escape.

In the design of this system the straight shot type of machine has been adopted (although the equipments of the old plant, as already described are of the Western type). The plant has been laid out for the immediate use of two generators, either one of which should have a sufficient capacity to supply the needs of the consolidated system, considerably in excess of present requirements. Of this equipment, one machine has been installed, with all auxiliaries so arranged and of capacity to handle the output from two machines. This makes it possible to install the second generator on very short notice and at small cost compared with the original installation, whenever the demand for gas shall exceed the safe margin of operation of the present equipment. The object of installing the type of machine adopted was on account of its greater efficiency and lower cost due to its great capacity and simplicity of operation. While some authorities may argue that these features do not

always apply, it would seem in the instance of this plant, from results of operation, that the selection of this type of machine was entirely justifiable.

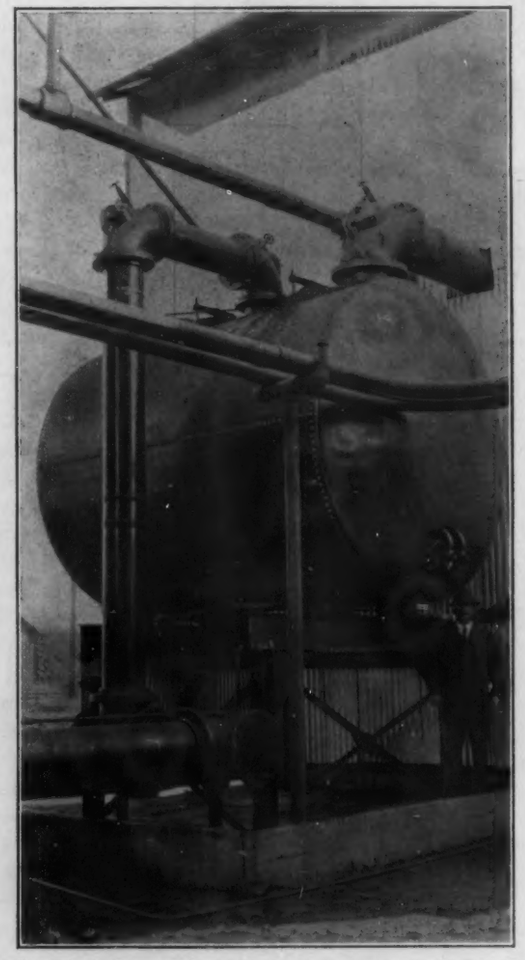
The generator was designed by Henry W. Burkhart, a consulting gas engineer of Los Angeles, and was built by the Baker Iron Works of the same place. It has an outside diameter over the steel shell of 8 ft., and the height from the floor to the stack valve is 22 ft. The stack is somewhat larger than general practice for this size of machine, being 4 ft. diameter. The shell has a double lining of 10 in., 3-Star gas circle-firebrick. The top of the shell is cone shaped, which allows the lining of the top to arch over from the sides without taking up space within the shell for the arch. The spherical top also prevents deposits of waste materials.

The checker work is composed of straight brick 4½ in. x 2½ in. x 9 in. This is supported on a four-way arch of checkered fire brick and at the center by a column of the same material. The combustion chamber is between the floor and the arches and has a height of 3 ft. There are four oil burners in the combustion chamber, placed in pairs, diametrically spaced around the circle of the chamber. These are introduced on an acute angle with a radius. Between the burners of each pair is introduced the air blast inlet, which, due to its position and the direction of the oil spray, gives a whirling motion to the flame so that its action on the sides and through the checker brick



Front (Upper) and Rear Views of the Operating Table.

tends toward a very efficient heating effect on every part. The oil supply nozzles into the making chamber are placed in a plane below the spring of the roof arch and the depth of the chamber below the oil supply nozzles to the top of the checker work is such that a line from the nozzle to the center of the upper surface of the checker work makes an angle of 45 degrees with the central axis of the machine. A steel inspection platform encircles the machine near the top to facilitate operation and inspection. Air from a steam turbine driven centrifugal blower is brought to the combustion chamber through two 12 in. sheet steel pipes which branch from a main, and within



The Wash Box. High Pressure Gas Piping in Foreground.

each, close to the generator is a castiron disc, quick-opening valve for regulating the blast. The gas outlet pipe from the combustion chamber has a vertical section 30 in. in diameter and 10 ft. high and this is lined with a double lagging of fire brick. This is necessary as the gas leaves the generator at a temperature of about 2200 degrees. There is a 30 in. door in this outlet through which entrance to the generator may be had for inspection or repair. On top of this vertical section is a 16 in. T and from this a 16 in. castiron pipe passes horizontally through the rear wall of the building and connects to one end, on top of the wash box, through an elbow and thence down into the box, to well below the center line.

Operating Table.

One of the interesting features of this installation is the operating table. This bears much the same relation to the gas machine, that the switchboard does to electrical generating machinery.

The operating table consists of two sections of 12 in. wrought iron pipe, 6 ft. long, laid horizontally side

by side and mounted on two concrete piers. These act as small reservoirs for fuel oil and steam. From one end a set of eight 2 in. wrought iron pipes, four from each header line above the tanks, are brought out at a convenient height from the floor for handling, and in each pipe is an operating valve. These valves control the steam and oil flow to each nozzle. The position of the valves with respect to each other is staggered, making two rows, the four valves in one row controlling the blast, and the others the make. At the other end of the table a similar provision is made to operate the second generator.

On one end of the operating table are mounted a pair of direct reading oil meters and beyond are mounted steam, air and water gauges, photometer gauge and burners to indicate the quality of gas being made. An elaborate and ingenious system of piping is necessary here. The gas-makers' desk and log-book stand close to the table and the entire operation of blasting and making gas is efficiently controlled by one man with almost no necessity for movement away from this point. This operating table is the design of Mr. W. A. White, general superintendent of the plant.

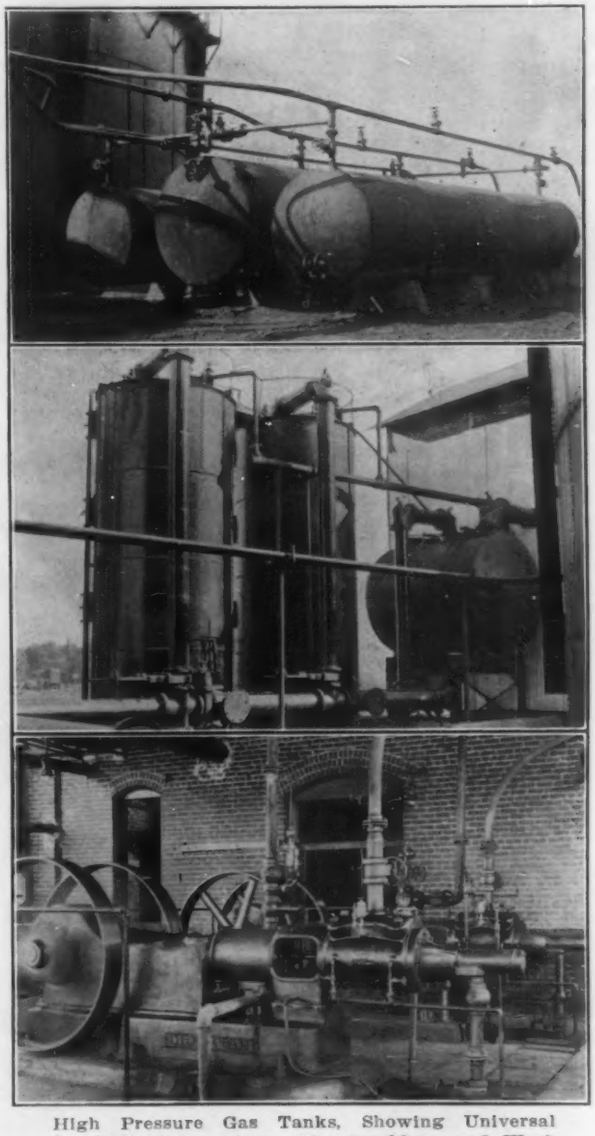
Wash Box.

The wash box is a horizontal cylinder, 8 ft. in diameter and 12 ft. long. It is made of sheet steel with riveted joints and has dished heads and is mounted so that it clears the ground 6 ft., on a structural steel frame. There is a covered opening on top at the opposite end from that of the gas inlet pipe to provide for another feeder from the second generator. At the center of the top is the outlet from which the gas passes to the scrubbers. Underneath are two manholes with hinged covers to permit rapid cleaning.

This wash box as designed by Mr. Burkhart is unique in gas practice and has proven of high efficiency in operation. The wash box is the first auxiliary in the manufacture of gas for the purpose of its purification. Its intent is two-fold. The gas enters at a high temperature from the generator, passes through water in the wash box, and its temperature is thus lowered to 110 degrees F. The passage of the gas is rapid and more or less violent, but serves to filter out a large proportion of the lampblack, which is in the form of an impalpable powder. An 8 in. outlet at the side of the box somewhat below the water surface, in order to form a water seal, to prevent the escape of gas in the box above the water surface, allows the water with its load of lampblack to flow away. This pipe at an elevation of 10 ft. above the floor is carried on iron pipe column supports across the operating floor to the lampblack infiltration tanks, into which it is discharged. In order to maintain a supply of water and to properly distribute it to cause a maximum of agitation in the wash box, a 2 in. wrought iron water pipe connects to a 6 in. header line delivering water from the pumping system under 40 lb. per square in. pressure. This is brought into the top of the box. It connects through a T to a horizontal header of the same size within the box near the top. At either end of this are two branches circling down to conform with the curvature of the box, to about the water level. The ends of these curved pipes are then connected by two horizontal sections reaching the length of the box. All of this piping is perforated with ⅛ in. holes and the many streams resulting permeate the gas, further removing lampblack and maintaining the supply level in the box.

Scrubbers.

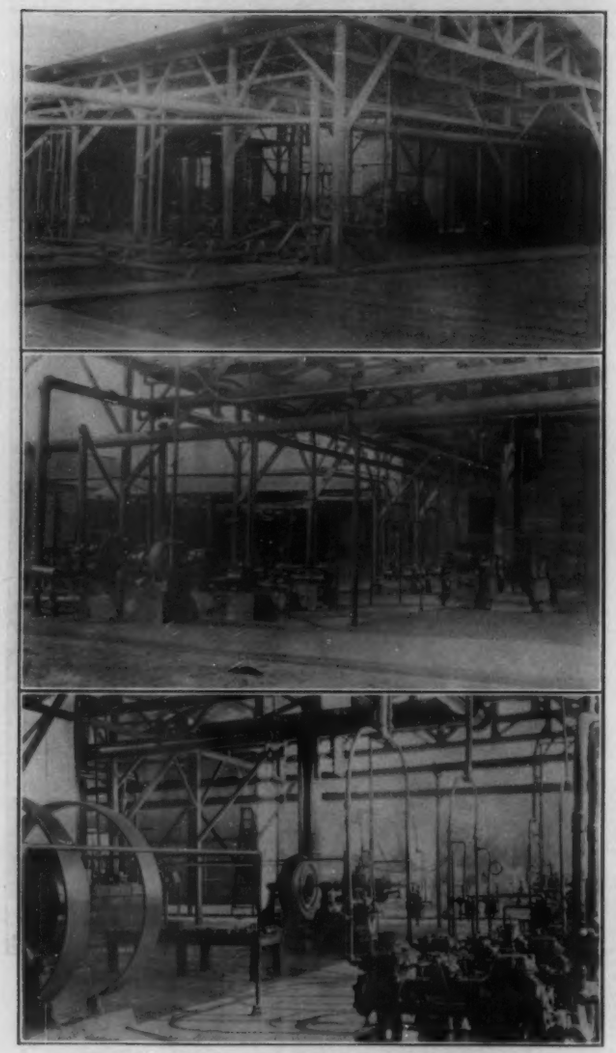
After passing through the wash box, the gas has lost much of its heat and most of the suspended lampblack, but still contains impurities undesired in the finished product—a small amount of lampblack; ordinarily a small quantity of asphaltic tar; sulphur in the form of hydrogen sulphide (H_2S) carbon dioxide, an



High Pressure Gas Tanks, Showing Universal Switching System. The Scrubbers and Wash Box (Right). The Gas Line Compressors.

inert gas so far as heating value or illumination is concerned; and a number of other ingredients in form of hydro-carbons or inert gases, generally in small quantities. The gas now passes from the top of the wash box through a carefully designed piping system to the top of each scrubber. Within the scrubber cylinders is a closed loop of 1¼ in. pipe extending across the top, down both sides and connected across the bottom. At 4 ft. intervals, plugged elbows are screwed into this pipe loop, each containing a narrow slot to form a

spray nozzle. These nozzles on opposite sides alternate with respect to each other and deliver water sprays which completely permeate the interior of the scrubber. Connection through the top of the scrubber is made to the 6 in. cold water pressure line and also to a 3 in. hot water line brought from the boilers. The cold water sprays remove the remainder of the lampblack and precipitate any tar which may be contained in the gas and incidentally further lower the temperature of the gas to 90 degrees F. The hot water connection dissolves the tar, which is discharged into the tar well. It may be noted here that very little tar is formed in this system. The gas outlet of the scrubbers is through the side near the bottom and ties into the same header as that of the inlet. Gate valves are introduced in the header line so that the flow of gas into the scrubbers may be in either direction, through one or both scrubbers in parallel or through both scrubbers in sequence, or directly into the holder line. The illustration of the wash box and scrubbers shows these connections very clearly.



View of Operating Floor, Showing Pumps, Turbo-Blower and Lampblack Infiltration Tanks.
View of Operating Floor in Opposite Direction.
View of Operating Floor, Showing Pumps and Compressors.

The wash box and scrubbers are designed to handle 80,000 cu. ft. of gas per hour.

There is a 2 in. hot water line connecting through valves at every point, where tar may be deposited.

Beyond the scrubbers the header line is 14 in. in diameter and makes a right turn through a + fitting to provide for connection to a future holder. At this point is a water column gauge to indicate pressure and a 1 in. line is carried back to the operating table to indicate to operator condition of green gas. The line, which is supported 3 ft. above ground, passes between the holders. There is a branch directly into the small holder; another branch, which divides, one leg connecting into the feeder line from the old plant generators and thence directly into the large holder, the other leg passing through branches to all purifiers, whose outlets connect into the old plant line to the large holder. There is also an underground connection (part of the old plant) from the small holder through the old purifiers.

Purifiers

The purifiers accomplish the final chemical clearing of impurities. The purifier installed with the new plant is of the tight-box type manufactured by the Baker Iron Works. It consists of a vertical steel cylinder with a conical steel cover, set in a concrete base. The operation consists of removing the sulphur (H_2S) content through the affinity of these gases for iron oxide. As this action ceases at low temperatures and is not efficient below 60 degrees, F., the purifying boxes are equipped with pipes for heating from the hot water circulating system. The iron oxide used is generally in the form of cast iron borings, which are allowed to rust, and these are mixed with pine shavings in order to give the mass porosity. Some care must be used in the filling material to prevent the introduction of chemical impurities, such as tannin and certain wood oils, detrimental to the operation. In this plant is used a prepared ferric oxide, known as "Ferox." The oxide is placed on grids, through which the gas is allowed to filter slowly. The new purifier has a capacity of 50,000 cu. ft. per hour, while the combined capacity of all of the purifiers is 80,000 cu. ft. per hour.

High Pressure System.

As all gas from this plant is supplied at high pressure, there is no use for exhausters. Gas is pumped directly from the holders by two compressors placed side by side on the operating floor. They are of the center crank and two flywheel "straight line" type, with steam and air cylinders in tandem, and are non-condensing, having been built by the Ingersoll-Rand Company, Class NF-1. The steam and gas cylinders are respectively 12 and 12¼ in. diameter, and the stroke 12 in., and the power rating is 60 h.p., with a capacity for compressing 310 cu. ft. free gas per minute, to a pressure of 60 lb. to the sq. in.

The high pressure gas is delivered into 3 in. gas-line wrought iron pipe, which is carried directly to the pressure tanks, being supported 8 ft. above ground on pipe columns with forked taps, all turns being bent and very gradual. There are four pipe lines, one from each of the four (including the two old) compressors. Three of these go straight through over the tanks to the outgoing transmission lines. There are two cross connections between the lines and the

tanks and a by-pass on the cross connection around the fourth feeder line. There are in this network 17 gate valves so placed that any combination of feed and supply may be made. This arrangement is well shown in the illustration. The pressure tanks are riveted sheet steel, mounted on concrete piers. Two of them are 5 ft., while the center one is 6 ft. in diameter.

Water Supply and Pumps.

The water pits are in the rear of the lampblack infiltrators and adjoining the operating floor. There are two driven wells, one 9 in. diameter and 78 ft. deep, while the other is 6 in. and 58 ft. deep. The overflow water from the scrubbers and also the filtration from the lampblack runs back into the water pits, so that but a small quantity of water must be pumped. There are two pumps, mounted on the operating floor for this purpose. The first is a Jeansville Iron Works, 4 in. Volute centrifugal pump, working to 90 ft. head, mounted on a cast iron base and concrete pier, and direct driven by a 15 h.p. style 122-C, 2700 r.p.m Kerr steam turbine. The capacity is 500 gal. per minute. The other pump is a Worthington duplex steam pump with 5x6 in. steam cylinders and 4 in. water inlet. This pump draws water from the wells or pit, while the centrifugal draws only from the pit.

Next to the water pumps are two duplex steam pumps, 6x4x6 in. and 6x4½x7 in. respectively. These are held in reserve and pump water into the system. Beyond these pumps are two Worthington duplex steam pumps, having cylinders 4½x2¾x4 in. These pump fuel oil from the storage tanks for use in the gas generator and under the boilers, there being an elaborate system of piping for these purposes. The remaining two pumps are of the same type as the last named, having cylinders 5¼x3½x5 in., and these operate in duplicate, pumping feed water to the boilers.

Blower.

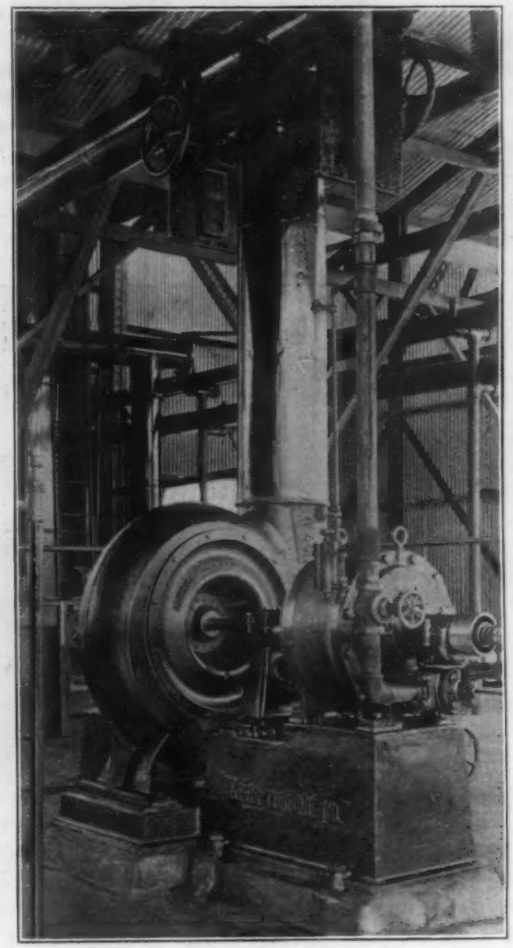
The remaining piece of apparatus on the operating floor is the blower, supplying the blast for the generator. This machine consists of a centrifugal blower made by the American Blower Company, Style W-431, direct connected to a 45 h.p., Size No. 124, Kerr turbine, operating at 2800 r.p.m. This rig has three bearings, is mounted on a cast iron base, which in turn rests on a concrete pier. A 15 in. outlet pipe delivers air into a header in which are placed two flat disc valves.

Piping.

One of the noticeable features of this installation is the elevated and exposed piping system. All piping, steam, air, water, oil and gas, are carried above the floor level, and in many cases at an ample height to afford headroom clearance under the pipes. This arrangement is a feature in the simplicity and economic operation of the plant.

Lampblack Disposal.

It is not an uncommon sight in gas plants to see several men shoveling or otherwise handling the lampblack. In this plant the lampblack is delivered, filtered, dried and deposited in front of the furnace doors of the boilers without handling. It is all consumed under the boilers, and the furnaceman shovels it into the grates. Water from the wash box carrying the lampblack is brought through a 10 in. wrought iron pipe, 10 ft. above the ground level, and this pours the solution directly into the two infiltration tanks, being turned into one or the other as may be required.



Turbo-Blower for Furnishing Blast. Gas Generator in Background.

Each of these tanks is 32 ft. long, 9 ft. wide inside, and 4½ ft. deep. They are built much like a mountain water flume, and are supported on posts and sills. The bottom of the tanks have longitudinal sills, on which are 2x4 in. cross sills or joists, spaced about 2 ft. apart. On these joists is a layer of ½ in. mesh galvanized iron netting, made of No. 12 wire. Placed on the netting is a layer of ½ in. crushed rock, 4 in. thick, and on top of this a layer of lampblack is allowed to remain, about 2 in. thick. The lampblack and water are deposited on this base and the water filters out by gravity and runs into the water pits over a concrete drainage floor under the tanks.

On the inside upper edge of the tanks, on either side, is a track, and this affords a runway for the four wheels of a flat scoop which moves the length of the tank. The scoop is made of planks and sets across the tank, completely filling it; it is hinged to and hung from a structural steel carriage, which is hauled back to the rear end of the tank by two steel cables. In operation, the scoop, which swings outward, is moved back over the accumulation of lampblack. It is then

drawn forward, when it assumes a vertical position, shoving a load of lampblack before it, which is deposited into a bin in front of the furnaces. Across the bins of each tank is a shaft with two windlass drums, on which are wound the steel hauling cables which pass under the tanks through pulleys and return to the scoop, while the other end of the cable is also fastened to the scoop frame. Both winch shafts are driven through reduction gears from a counter shaft on which is a shifting clutch to connect to either side. The counter shaft is driven through a chain by a 5 h.p. marine type reversing steam engine mounted on a platform between the tanks. When the lampblack is exhausted in the bins, the furnace man starts the engine and scoops a new supply from either or both tanks.

to the variation in the heat with consequent shrinkage in cooling. It is the custom to total the amount of gas which passes through meters and the amount of gas lost in transmission by leakage or contraction. It is estimated under the head of "unaccounted-for gas," although different gas men calculate this in various ways. During the month of September last the unaccounted-for gas was estimated at 16 per cent, of which 3 per cent was due to condensation.

One man, known as the "gas-maker," is required for the operation of the generator. In making gas, the blast, which heats the checker work within the machine, is run for a period of 10 minutes. At the end of this time, the gas-maker shuts off the blast, closes the stack valve and opens the make nozzles. Gas-making occupies a period of 20 minutes. This operation is immediately repeated, thus requiring one hour for a run. The making is stopped when the generator cools to a point where gas ceases to form properly. This is indicated by the appearance of oil on the water running from the scrubbers, and the lampblack stops forming. No pyrometer is used to indicate heat condition, as the interior temperature of the generator varies from point to point.

Boiler Room: Boilers on Left, Lampblack Bins on Right.

Characteristics and Operation.

The gas made at this plant is an oil gas with a heat value of 600 B.t.u. per cu. ft., and gives 18 candle power with a 4 cu. ft. per hour open tip burner on the bar photometer.

The oil used for fuel and gas making purposes is known as Union special fuel oil and is 24 gravity test on the Baume scale. This oil is treated by the producers to obtain a low sulphur content, which averages one-half of one per cent. A slightly higher price is paid for this oil over that of untreated oil to obtain this advantage.

The cost of oil at the plant is 70 cents per barrel, a saving of over 30 per cent over the price paid by the older companies.

When the plant at Porterville was taken over, there was required 22 gallons of oil to produce each 1000 cu. ft. of gas. The old Visalia plant required about 18 gallons oil for each 1000 cu. ft. of gas at the consumer's feeders. The present installation is delivering gas with the consumption of about 12 gallons oil per 1000 cu. ft. of gas. Of this 3 gallons is required by the boilers in operating the compressors, pumps, etc., while the remaining 9 gallons is supplied to the generator in blasting and making. This is said to be a remarkable record for an installation of this size and speaks well for the efficiency of the plant. It is a curious fact that there is no absolute way of determining just what quantity of gas is made at the generator, due

This plant is operated by two men on each of two shifts—a gas-maker and a fireman. This is another result of economic design and operation and is not often equalled in plants of this size.

Under the present demand the small holder is held in reserve. It is proposed in the near future to fill it simultaneously with the larger holder by properly adjusting the weighting of the lift.

The Transmission System.

The piping system which takes the high pressure gas to the various points of distribution is in three separate and distinct lines and supplies all of the principal towns in Tulare County. These are known as the Visalia, Tulare and Porterville lines, these cities being the terminal points. The present installation represents the beginning of a network which will radiate from the plant at Visalia and eventually extend north and west, while branches from the present lines to supply districts to the south and east of those now supplied are planned for construction in the future.

The Tulare line has been in place for about 5 years and formed a part of the old Visalia system taken over by the present owners. This line was built in accordance with practice which has been in vogue for a decade past, but in this instance its operation has pointed to the possibilities of improvement which have been embraced in the design of the Porterville line.

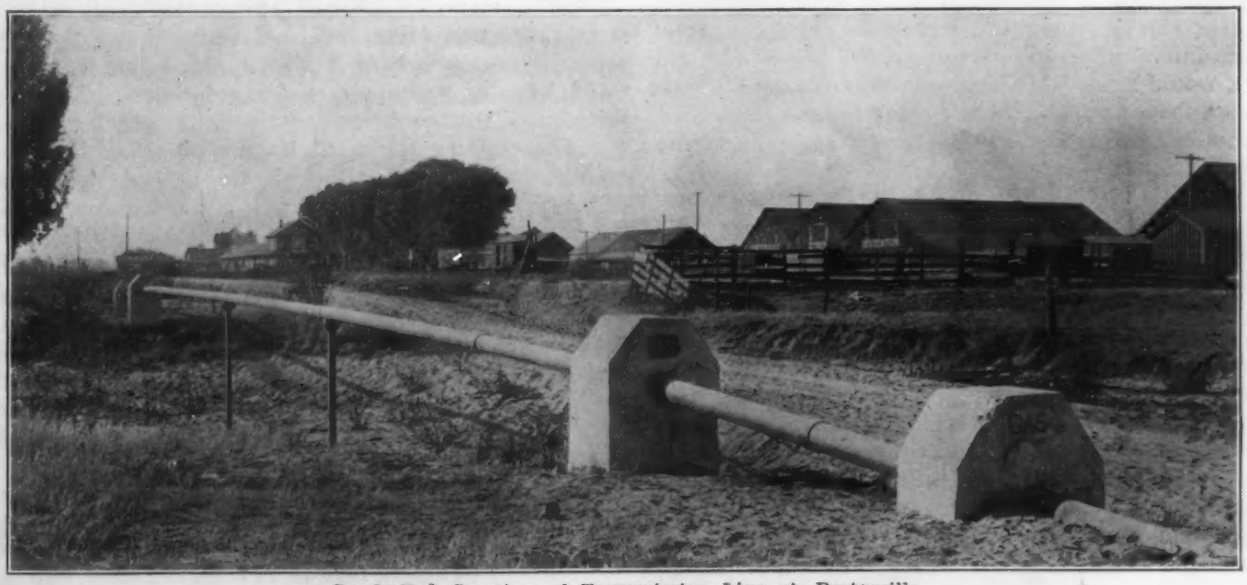
The line from Visalia to Tulare has a length of 8.9 miles. After leaving the pressure regulator the line parallels both the Visalia local feeder and the Porterville line, all of which are placed under the street, the line passing through the street manholes, but without valves or interconnection, until the southerly limit of the city of Visalia is reached. Here interconnection is made through valves with both other lines, to be used only in emergency. The line now turns at right angles, following a street and eventually a county road for a short distance, when it again turns south, following a county road until about one mile due east from Tulare, when the course is westward into that city. In following the county roads, the pipe is buried an average of 2 ft. below the surface and about 3 ft. outside of the fence line, which places it well away from the traveled part of the highway. A franchise from Tulare County affords the right of occupation and maintenance. This line consists of high pressure gas-line, lap-welded steel pipe, 2½ in. diameter, tested to 1500 lb. per sq. in. Tapered screw joints are used and a straight sleeve coupling. In laying this line no protective covering was used where the pipe is exposed, as in crossing ditches or water courses. While there has proven to be little danger from mechanical damage to the line, there is a variation in temperature of the pipe where exposed which has the effect on the gas, while passing a section where there is a sudden change in temperature, of causing naphthalene to be formed by condensation. This product, which is a flaky crystalline hydro-carbon, is to be avoided, as it is the cause of obstruction, lowering the efficiency in transmission by incrustation and is one of the principal sources of annoyance in operating a gas line. While these exposed sections are short and relatively few, the proper protection from trouble by this cause has been taken in the construction of the newer line.

There being but one principal point of distribution on this line, pressure regulation is accomplished at Visalia, the pressure being maintained at 30 lb. per sq. in. After entering Tulare the line follows a main cross street. At the entrance of the city proper, two branches take off in opposite directions, these forming two loops which join the straight through line at its terminus. The service pressure is maintained at 4 in. water pressure. Meters and regulators are similar to those used in other parts of the system, which are described elsewhere.

The Porterville line represents a modern practice of gas transmission for pressures and distances as presented in this system. As there are five points of distribution, individual regulation for these points is used by placing a pressure regulator at each point.

The line after leaving the right one of the three pressure tanks at the central plant, follows both the Tulare line and the local distribution, passing through the junction manhole to the crossing of the Atchison, Topeka & Santa Fe Railway, thence along a county road for ¾ of a mile, after which it takes to a county highway going easterly for 1½ miles, then south for ½ mile, then east, keeping the north side of the road, a distance of 6 miles to Exeter. In this 6 mile tangent, the line passes through the town of Farmersville. After passing the length of the main business street of Exeter the easterly direction is maintained for 1 mile and then the line takes a southerly direction which is followed for 6 miles to a turn to the eastward when a distance of one mile reaches Lindsay. The line passes around the business section of this city, reaching it through cross feeders, thence continuing ¾ of a mile to the eastward, whence it again turns south, following the county road for 4 miles through the town of Strathmore, thence following the Southern Pacific right of way for 2½ miles until the boulevard into Porterville is reached, which is followed for 2½ miles into the city of Porterville. The line is taken directly to the old gas plant, where connection is made through a pressure regulator into the Porterville distributing system.

This system consists of a loop around the city with cross branches and a line through the principal business street. This loop is constructed in the con-



Creek Bed Crossing of Transmission Line at Porterville.

ventional manner having been used by the old plant, now not in use but held as a reserve. As at all other points, individual service regulators are used. The connection with the plant at this place is such that the holder, which has a capacity of 10,000 cu. ft., may be filled from the pipeline; in case of emergency it is possible to draw this storage obtaining the proper pressure by means of a steam driven compressor which has a capacity of 10,000 cu. ft. per hour to the transmission pressure.

Typical Transmission Line Crossings: Irrigation Ditch (Upper); Packwood Creek, near Visalia (Lower).

The old generating plant in Porterville is enclosed in a corrugated iron building. It is equipped with one Western type generator having a capacity of 7,000 cu. ft. of gas per hour. The gas from the generator is delivered through a vertical drum wash box to two scrubbers, each 14 ft. high and 3½ ft. diameter. In a separate room is a 45 h.p. horizontal tubular boiler and the compressor above mentioned. This plant is in condition for use in emergency, but being of an old type, would not show the efficiency or economy in operation that is possible by the central plant, but would maintain service in the event of interruption in the transmission line.

The Porterville line was built by the company. When it was decided to make this installation bids were called for from engineering construction companies. It was found that the company could build this line for about 11 per cent less than the estimates from contractors, either on straight bid or by the cost-plus-fixed-percentage plan. The general design and construction represents the best thought and practice in gas transmission of this type, and operation for six months in supplying the territory throughout the length of the line has proved eminently successful.

The total length of the line to the Porterville auxiliary plant is 32 miles. This line throughout is 3 in. special gas-line lap welded wrought iron pipe, tested to a pressure of 1500 lb. per sq. in. and weighs 7.54 lb. per ft. The ends have tapered screw threads, while the couplings having corresponding tapers and the ends are recessed so that the joint may be caulked. While the line pressure is but 30 lb. per sq. in., an extra strong and high grade pipe is desirable purely from mechanical considerations. The danger of leakage from splitting or cracking is obviated and with a high pressure gas line such precaution is of the utmost importance. This pipe was furnished by the U. S. Steel Corporation. In location the pipe is placed at the side of the road, about 3 ft. from the fence line, although this distance varies according to the topography on the ground surface. The average depth is 2 ft. In laying and screwing up the line a special style of lay-tongs was used. This has a grip similar to a Stillson wrench, but with the movable jaw brought to a flat point. They are built to take this size of pipe only and have a handle about 6 ft. long. These tongs were found to be very serviceable in handling this work.

The particular features of the line are the manholes, great number of valves and flanged unions, method of crossing watercourses and low ground and the protection at these exposed points.

There are 72 manholes in the length of the line. These were placed wherever there is a flanged union or a gate valve. The manhole serves not only as a protection but makes it possible to locate a union or valve quickly, a thing which might be a matter of some difficulty where the location of the part in question may be thoroughly obscured by brush, grass or other rank growths. Manholes are simple and inexpensive, having no bottom paving apart from the earth of the excavation tamped level and smooth. The sides are circular, about 30 in. inside diameter at the bottom and built of common brick laid up with cement mortar. The side wall tapers to the top on which is placed a cast-iron frame 22 in. diameter overall, within which is a flush fitting cast-iron cover, 18 in. diameter. The depth varies from 2 ft. to 6 ft., depending upon the depth of the pipe below the surface. Manholes are placed at or near one end of every crossing over a watercourse, where the span is over 6 ft. and also at regular distances where the line may be sectionalized. Of the 72 manholes, 28 of them contain steel screw-stem disc gate valves. These valves have tapered screw joints, but there is also in the manhole, separated by a short nipple, a flanged union. The remainder of the manholes contain only flanged unions.

The country traversed by the pipe line is, generally speaking, flat, although throughout this part of the San Joaquin valley, there is a gradual slope from the edge of the foothills of the Sierra Nevada toward the center line of the valley. The general trend of watercourses is west or southwest and there are many intermediate watercourses, some scarcely more than depressions and all of them dry for a large part of each year, and these are necessarily crossed by county roads and hence must be crossed by the pipe line in question. During the winter or rainfall season all watercourses carry flood waters and the surface drainage and oftentimes a very innocent appearing depression may become a raging torrent. For this reason it is necessary to design a pipe crossing with a two-fold purpose of ample clearance, allowing flood waters

to flow unobstructed under the pipe and supporting the pipe at sufficient height to prevent any possible damage from floating objects and debris. To fulfill these requirements the pipe is usually raised from one to two feet at the center of the crossing, giving the pipe the form of an arch. Concrete piers are used to

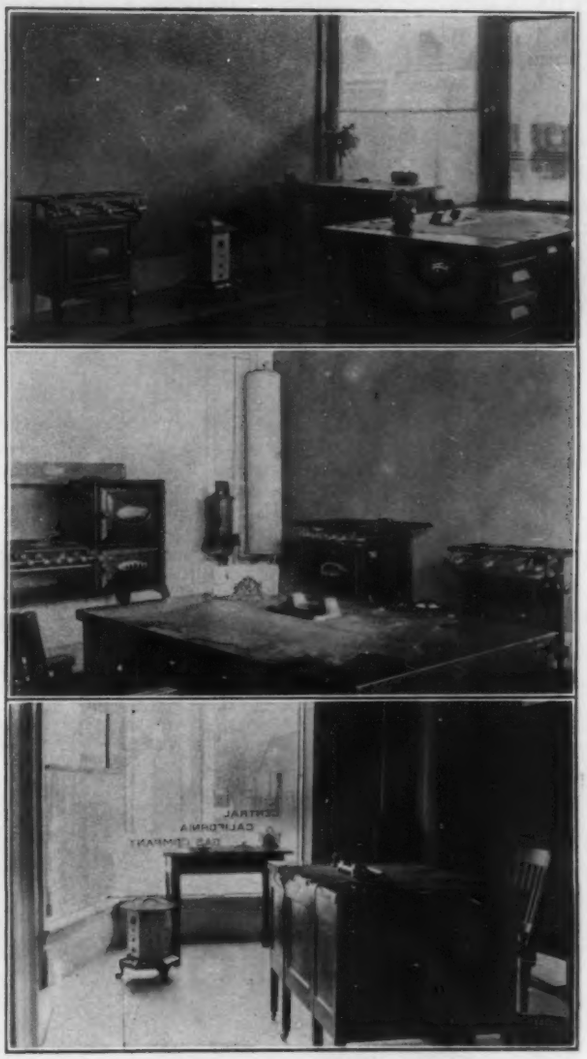
A Transmission Line Manhole, Showing Gate Valve and Flange.

maintain this position, these being similar in design throughout the line. The crossings vary from 6 ft. where a small irrigation ditch may be crossed to 250 ft. where the bed of a watercourse is unusually wide, although the road bridge may be much shorter. The concrete piers have a section 2 ft. wide and 1 ft. thick at the top, the sides battering slightly. The edges at the top of the pier are beveled to a 1 to 1 batter. The pipe, which passes through the pier on the center axis of its width is placed with its center 1 ft. below the top. The pier height varies with the topography from 2 ft. to 8 ft. and they are invariably carried into the ground to a depth which will give assurance of a stable foundation. In many cases a base of carefully laid loose rock is first put in, on which the pier is placed. In building the concrete piers, a simple movable form was used. The top of the piers are troweled smooth and the initials of the company indented thereon, while a rectangular recess was left on one side near the top, which was later filled with cement plaster and the word "Gas" in letters 4 in. high indented therein. Where the span is not over 25 ft., but two piers are used. For longer spans more piers are used, depending upon the topography. These are spaced 12 to 22 ft. apart with the exception of the main span which may be greater and in one instance this span is 56 ft.

For the mechanical protection of the pipe and also to maintain the temperature as nearly as possible constant and thus prevent the formation of naphthalene, from a sudden decrease in temperature of an exposed section, there has been slipped over the pipe at all exposed points, 6 in. diameter O. D. casing, a welded steel pipe. This protective covering has the added advantage of maintaining the arch curve of the crossing and preventing expansion and contraction of the transmission pipe due to temperature changes.

Wherever a distribution point has been established, a district regulator is used. These are Chapman-Fulton regulators, reducing from 30 lb. to 10 lb., and have a capacity of about 20,000 cu. ft. per hour.

At both Exeter and Lindsay, service mains are looped around the towns, with cross connections to the business section so that practically every house and store may have gas connection. Throughout the system service mains consist of 2 in. diameter, special gas-line wrought iron pipe which weighs 5.74 lb. per ft. Services are equipped with individual pounds-to-inches regulators. These were furnished by the Reliance Gas Regulator & Machine Company of Pasadena, Cal. The service conection is ¾ in., and the regulator will



An Interior View in the Visalia Office.
A Corner of the Visalia Office.
Interior View of Porterville Office.

pass up to 500 cu. ft. of gas per minute at 6 in. water pressure.

There are three district regulators in Exeter and two in Lindsay, while at Farmersville and Strathmore there are one each.

At a number of points along the line service connections are tapped directly, using a regulator for the proper reduction for service, in fact, the company is encouraging the use of gas for all purposes wherever a line can conveniently reach the customer and already many ranch houses are supplied with gas with which the houses are heated and lighted and cooking is done solely.

The third section of the distribution system is the local supply for the City of Visalia. The high pressure system is used in this distribution, a separate line being brought from the middle one of the three pressure tanks at the central plant. This line parallels the other two high pressure lines to the first or junction manhole, two blocks west of the plant. This is a large brick street manhole, about 4 ft. in diameter at the bottom and 6 ft. deep and has a cast-iron street cover. Within this manhole is a T connection and valve on a 2 in. branch line, and also a 30 lb. to 10 lb. pressure regulator. This branch forms a loop extending across the northern edge of the city and joining the next westerly crosstown line at its extremity. The local pressure line after passing through the junction manhole, still parallels the other two pressure lines, following the street southward until the second manhole, two blocks distant, is reached. Here again is a T connection with 2 in. outlet and reducing valve from which are taken two branches, each having valves, the one following the street east and the other in the opposite direction. The third and fourth manholes are spaced each two blocks from the last and the equipment is similar to the one just described. The high pressure line of the local system is 3 in. and similar to the Porterville line. The local distribution is uniformly 2 in. gas-line pipe and service connections are similar to those already described for other distributing points.

Tulare has a population of 3500 and is on the main line of the Southern Pacific about 10 miles from Visalia. Like Visalia it has an unusually well built business section which is surrounded by substantial residences, many of them of a high order, and the residence streets are wide and well shaded.

The towns of Exeter and Lindsay have not been in existence as long as Visalia or Tulare, and hence are not so large, their populations being 2400 and 3000 respectively. But both of these places are growing fast and give great promise for the future. They are both on the Southern Pacific and the former is on the Visalia Electric Railway. Both are heavy shipping points for oranges, lemons and other citrus fruits. The streets are wide and are rapidly building up with fine office buildings and stores, and the homes give every evidence that the great prosperity of this county has showered its share in these places.

Porterville is next in size to Visalia with a population of 4000. It is nestled in a most picturesque manner at the edge of the Sierra Nevada foothills with their highly cultivated orchards of orange and lemon trees. In the background, rising rapidly and seeming but a few miles away, the higher reaches of the Sierra Nevadas are tipped with snow peaks, one of which is Mt. Whitney, the loftiest summit in the United States. The main business street in Porterville is unusual for its width and fine appearance and wealth and prosperity is evidenced on every hand.

The total population served by the lines of the company is 21,000. Outside of the city and town limits, it has been the policy of the company to serve gas wherever it is possible to extend its lines to a customer. There are along the county roads and crossroads a population of 1400 which can be reached at present.

Since the new company has commenced service the growth in business has been phenomenal and while the field of opportunity has by no means been exhausted, there are now in excess of 3000 immediate customers, of which 2400 are being served.

The following table shows the number of meters installed:

	Population.	Meters.
Visalia	6,000	823
Tulare	3,500	383
Exeter	2,400	160
Lindsay	3,000	234
Strathmore	500	23
Farmersville	300	40
Porterville	4,000	423
	19,700	2086

The Main Business Street in Porterville.

Since the first of the present year, new business has at times come in faster than the generating capacity of the plant could provide for and already the first unit of the new installation is working to its capacity and will require extensions which it was not expected to have to provide for another year.

Main Street, Lindsay (Upper). A Business Street in Visalia (Lower).

The sale and use of gas using appliances is an indication of business growth. The company handle very complete lines of this apparatus at each of its offices with the necessary shop equipment to give the customer quick and efficient service. The customer's investment of appliances on this system will amount to $60,000. Since January 1st of the present year, the company has sold to customers over $17,000 worth of these equipments.

The company offices in the five principal towns are centrally located and in a way are unique. There are no counters and window gratings. Each office is tastefully finished and neatly furnished and carpeted and has the air and appearance of a well appointed private business office. The office manager has a flat-top desk and there is another desk for the convenience of customers with stationery, etc., ready for use. A few representative appliances are in evidence and altogether there is an air of cheerfulness and consideration for the customer which is generally appreciated.

LETTER TO THE EDITOR.

Nov. 18, 1913.

Dear Sir:—In your issue of October 11th, containing article "The Automobile in Modern Gas Distribution," permit me to call your attention to page No. 325, wherein it states, "Cost to Lay 300 ft. of Pipe." This should read, "Cost to Lay 100 ft. of Pipe." While the error is considerably in my favor, for which I most kindly thank you, nevertheless it is erroneous and should be corrected.

Yours very truly,

D. E. KEPPELMAN.

Superintendent Gas Department,
Pacific Gas and Electric Company,
San Francisco District.

THE DISTRICT AGENT.

BY W. R. NEELANDS.

(The author presents an interesting and complete exposition of the duties and responsibilities of the central station district agent. Mr. Neelands is District Agent for the Southern California Edison Company at Monrovia, Cal.—The Editors.)

To the question "What does business really mean?" Andrew Carnegie replied, "I would begin by saying that the root of business must always be service to the public."

The Southern Califonia Edison Company, in its business of generating, transmission and distribution of electric energy covers a large portion of the southern part of the state. This business field is divided into districts, and that the service to the public shall be maintained at all times at a high standard, the company has selected men who are called district agents, placed them in charge of these districts, and given into their hands the management of its valuable and important interests.

The district agent acts for the company in its intercourse with the public by virtue of his appointment, and he acts for the public in its intercourse with the company by his position, meaning that the permanent interests of the company and of the public are really along parallel lines.

In this dual position which he occupies, we will first consider the district agent's relation to the company. This is one of great responsibility. He is made the custodian of the company's property and the protector of its valuable investment and business—the property of the company in his district is under the general supervision and care of the agent, and he should know all that is going on, or being done in the way of changes, additions or extensions to this property. He should study to know the weak places, if there are any and be on the alert and able to act promptly should any trouble occur either from accidents or the elements. Not only are the plants, buildings and lines of the company under his care, but he is expected to keep his eye on the franchise rights to see that they are in no wise endangered. Having this in view, it is of the utmost importance that all matters affecting or liable to affect the company's interests directly or indirectly, should immediately be brought to the attention of the head office. He should not take it for granted that this or that will be known without his saying anything, but should promptly send an explicit report to the proper officer, and when his report has been made, and not until then, has he relieved himself of a certain amount of responsibility. Neglect of this is nothing less than unfaithfulness to his trust.

The district agent must at all times defend and advance the interests of the company. Expenditures should be carefully studied, and, before making any recommendation that entail cost, he should first say: "Would I advise this expense if this business were my own; will it give the return or prove as profitable as I would want it to?" If there arises a question in his mind it should be brought out, and higher authority consulted if the expenditure is asked for. The agent in his district is the eyes and the business judgment of the company. He can understand the local conditions better than the head office officials, and

so they must rely to a great extent on his knowledge and recommendations in authorizing an increase of investment in his district.

That the company may have a correct and full understanding of its interests, the district agent should work in perfect harmony with the various departments at the head office, and see that the weekly and monthly reports are forwarded with correctness and dispatch.

Eight years ago, in a paper read in the district agents' meeting of the company, the district agent as "A Business Builder and Developer" was discussed and special reference was made to the great problem which electric companies were at that time trying to solve—that of equalization. Showing the great investment, with a large annual charge for interest and depreciation, lying idle for practically eighteen hours out of every twenty-four, and of the six hours that were income producing there was about sixty minutes of peak, and it was this peak that added so materially to cost of operation. It was then urged that an active effort be made in the securing of paying business on the lines for the eighteen non-productive hours, and this was what all electric companies must aim at. The placing of electric appliances in the homes that the company served, and an active canvass to install the electric motor where the gas engine was then used, it was claimed would go a long way in securing the even load so much desired. How wise that admonition was we all now know, and I can easily believe that the writer of that article is himself greatly surprised at the developments made—the night peak having changed to a day peak with a good load factor. This should have but one result in the agent's relation to the company; an unswerving purpose to advance the business of the company along present lines and the development of methods for new business that will go to make for a still better load factor. The man who is daily in touch with that most spiritual of all agents—electricity—with its developments, will be a strange man if he is not stirred out of the humdrum of business life to give vent to imagination of possibilities which worked out are realized in actual results and later shown in the operating report.

The agent will not be afraid of the new appliance when he remembers that the iron which today is guaranteed for ten years and for life, had many weak points on its introduction. A few years ago his helpers were small in number. Today every member of every house the company serves is boosting for applied electricity, the best kind of advertising without cost. In my city last month there were no less than three short editorials in the daily paper crying out against the noisy gas engines, and that they should be displaced with the electric motor.

The live district agent should always take an active interest in all wise plans that stand for developing the community he serves, assisting by personal and financial effort as his time and means will permit.

As the agent's work in giving service to the public is naturally varied, he must cultivate broadness of mind and develop the finest character. Character counts. As our general superintendent once put it: "A man's proper worth to the company is not measured by gross earning or operating expenses, though these may have some effect on the length of his service, but his real value is measured by the esteem in which he is held in the community he serves. In other words, the final analysis, so far as the agent is concerned, is character."

The service the agent represents being that of a public utility, he will from time to time come in contact with the city council and several of the city's department heads. He should give them assurance that it is the company's will that he and all employes of the company carefully obey all ordinances of the city. As opportunity is given, he will show his friendliness and be ready to advise with them on any improvement considered for the city's good pertaining to the company service, showing that he is a good citizen as well as a business man. If this spirit is cultivated the agent's protest against any legislation that he believes will be hurtful to good service will have much greater weight.

The greatest safeguard against a community granting privilege to any rival public service corporation that a present company may have, is its popularity. Rival companies do not attempt war where the community is with the corporation already in the field.

The district agent must be on the friendliest terms with the business men of the community, frequently calling on them, making inquiry about the service and watching for opportunities to improve the lighting system of the stores, ever alert, as a wise salesman, to secure increase in business.

When in the office be easy of access and listen with the same attention and interest to a complaint as to a new power prospect. The man with a complaint, real or imaginary, should not be judged by that interview. For at this time he has a grouch and at all other times he may be the finest kind of a fellow.

The agent's personality will affect all the employes of the company associated with him, either for good or ill. It is well known that every business concern depends on the personal power of every man employed by it. It cannot make an exception of a single man or boy, woman or girl. Each has personal power to do the company harm or help it because of his or her contact with the public. A high standard maintained by the agent will, in a large measure, be copied by the employes, so he will carefully study the employes, especially those who are daily in contact with the public—such as the office force, the collectors, the troublemen, etc., for he knows the company demands the most courteous treatment and fair dealings to all customers. The company is giving service to the public, hence is a servant of the public, and each employe is the company in so far as he has anything to do with this service. Familiarity may breed contempt, but friendliness and courtesy on the part of the agent with employes and people will win the confidence and heartiest support of those under him, and the highest esteem of the community. The business world needs today more courteous, tolerant men. The cultivation of good manners—the manners founded on love and good will to fellow men will develop a magnet that will draw everything desired toward you.

The district agent can do no greater service for the

company and the public than in the securing of good men and their development. The company requires live wires overhead and underground, but also on the ground in the form of men of energy and adaptability —men who have storage batteries inside of them, so that they need not come to the agent for inspiration, but have the force in themselves to take up conditions that they may meet and bring results. Never be afraid to encourage and advance such an employe, even though you see the possibility of his going over you. They, in all likelihood, will go anyway, and the agent might better have the credit of giving to the company the man it has been looking for. The agent who in his service to the company and the people is doing his work well, and conscientiously, need never fear of losing his position to some other unless it is because of his own advancement.

It is but fair to the district agents of this company to say, they are loyal in their service to the company and the public, and it might be well to ask the cause of this spirit of loyalty? It is not the name, the Southern California Edison Company, but the personnel of the company. It is the men who are directing the affairs of this great corporation who appeal to us. We know them for their sterling personality and their spirit for the square deal to all their consumers—the public—and to the employes. Knowing this, we esteem and honor and feel ourselves favored in being identified with them. This same feeling, through the district agent, should in no small degree be what attaches the public and the employes in the districts to the company. As one business man said to one of our district agents, "I am glad to have known you and to have done business through you, for you have shown to me that there is one corporation that has a soul."

Sun-Power Plant Demonstration in Egypt.—A public demonstration was given recently of the workings of the sun-power plant erected by a New York concern at Meadi, near Cairo, in Egypt. The principle involved in the plant is the invention of Frank Shuman, an American, who supervised the erection of the plant and is conducting the experiments. The plant covers several acres of land on the west bank of the Nile. A series of reflectors and absorbers, a low-pressure steam engine, a condenser, and a pump comprise the principal independent units of the mechanism. There are five reflectors, each of which is 204 ft. long and parabolic in form. They are spaced in intervals of 20 ft., and made up of a series of ⅛-in. glass mirrors. The reflectors aggregate a total light absorptive surface of 13,500 sq. ft., are placed in iron frames, and geared and interconnected with the engine by an arrangement of cog wheels. The mirrors automatically follow the course of the sun, and are regulated by what is termed a thermostat, the secret of the invention.

Running exactly down the center of each reflector is the boiler or absorber, a box of ⅜-in. metal with a tube at the top. By means of an automatic feed the box is constantly half full of water. The reflected sun rays are concentrated on these boilers, and the steam generated is led from the various units to the engine. The 100 h.p. engine is of the low-pressure type. The exhaust is returned to the boilers through a condenser.

ELECTRIC SIGNS OF NEW YORK.

BY RUPERT BROOKE.

(The question is often asked, "Do people read electric signs," and the answer of those who have analyzed the question carefully is to the effect that the passer-by is bound to, for they literally burn themselves into our memory as indicated in this remarkable literary description of impressions of some New York electric signs. It is abstracted from a series of articles on "America," appearing in the "Westminster Gazette," London, Eng.—The Editors.)

Cities, like cats, will reveal themselves at night. There comes an hour of evening when lower Broadway, the business end of the town, is deserted. And if, having felt yourself immersed in men and the frenzy of cities all day, you stand out in the street in this sudden hush, you will hear, like a strange questioning voice from another world, the melancholy boom of a foghorn, and realize that not half a mile away are the waters of the sea, and some great liner making its slow way out to the Atlantic. After that, the lights come out up-town, and the New York of theatres and vaudevilles and restaurants begins to roar and flare. The merciless lights throw a mask of unradiant glare on the human beings in the streets, making each face hard set, wolfish, terribly blue. The chorus of voices becomes shriller. The buildings tower away into obscurity, looking strangely theatrical, because lit from below. And beyond them soars the purple roof of the night. A stranger of another race, loitering here, might cast his eyes up, in a vague wonder what powers, kind or maleficent, controlled or observed this whirlpool. He would find only this unresponsive canopy of black, unpierced even, if the seeker stood near a centre of lights, by any star. But while he looks, away up in the sky, out of the gulfs of night, spring two vast fiery toothbrushes, erect, leaning towards each other, and hanging on to the bristles of them a little Devil, little but gigantic, who kicks and wriggles and glares. After a few moments the Devil, baffled by the firmness of the bristles, stops, hangs still, rolls his eyes, moon-large, and, in a fury of disappointment, goes out, leaving only the night, blacker and a little bewildered, and the unconscious throngs of ant-like human beings. Turning with terrified relief from this exhibition of diabolic impotence, the stranger finds a divine hand writing slowly across the opposite quarter of the heavens its igneous message of warning to the nations, "Wear ——— Underwear for Youths and Men-Boys." And close by this message come forth a youth and a man-boy, flaming and immortal, clad in celestial underwear, box a short round, vanish, reappear for another round, and again disappear. Night after night they wage this combat. What gods they are who fight endlessly and indecisively over New York is not for our knowledge; whether it be Thor and Odin, or Zeus and Cronos, or Michael and Lucifer, or Ormuzd and Ahriman, or Good-as-a-means and Good-as-an-end. The ways of our lords were ever riddling and obscure. To the right a celestial bottle, stretching from the horizon to the zenith, appears, is uncorked, and scatters the worlds with the foam of what ambrosial liquor may have been within. Beyond, a Spanish goddess, some minor deity in the Dionysian theogony, dances continually, rapt and mysterious, to the music of the spheres, her head in Cassiopeia and her twinkling feet among the Pleiades. And near her, Orion, archer no longer, releases him-

self from his strained posture to drive a sidereal golf-ball out of sight through the meadows of Paradise; then poses, addresses, and drives again.

"O Ninevah, are these thy gods,
Thine also, mighty Ninevah?"

Why this theophany, or how the gods have got out to perform their various "stunts" on the flammantia moenia mundi, is not asked by their incurious devotees. Through Broadway the dingily glittering tide spreads itself over the sands of "amusement." Theatres and "movies" are aglare. Cars shriek down the street; the Elevated train clangs and curves perilously overhead; newsboys wail the baseball news; wits cry their obscure challenges to one another, "I should worry!" or "She's some Daisy!" or "Good-night, Nurse!" In houses off the streets around children are being born, lovers are kissing, people are dying. Above, in the midst of those coruscating divinities, sits one older and greater than any. Most colossal of all, it flashes momently out, a woman's head, all flame against the darkness. It is beautiful, passionless, in its simplicity and conventional representation queerly like an archaic Greek or early Egyptian figure. Queen of the night behind, and of the gods around, and of the city below—here, if at all, you think, may one find the answer to the riddle. Her ostensible message, burning in the firmament beside her, is that we should buy pepsin chewing gum. But there is more, not to be given in words, ineffable. Suddenly, when she has surveyed mankind, she closes her left eye. Three times she winks, and then vanishes. No ordinary winks these, but portentous, terrifyingly steady, obliterating a great tract of the sky. Hour by hour she does this, night by night, year by year. That enigmatic obscuration of light, that answer that is no answer, is, perhaps, the first thing in this world that a child born near here will see, and the last that a dying man will have to take for a message to the curious dead. She is immortal. Men have worshipped her as Isis and as Ashtaroth, as Venus, as Cybele, Mother of the Gods, and as Mary. There is a statue of her by the steps of the British Museum. Here, above the fantastic civilization she observes, she has no name. She is older than the skyscrapers amongst which she sits; and one, certainly, of her eyelids is a trifle weary. And the only answer to our cries, the only comment upon our cities, is that divine stare, the wink, once, twice, thrice. And then darkness.

Electricity on James J. Hill's farm is to be quite a prominent feature. The new $150,000 mansion is being erected at North Oaks on a 7000-acre farm near White Bear, Minn., and will be equipped to utilize electricity to the fullest extent. Electric power will also be used for various farming operations, the total connected load amounting to about 65 h.p. Electrical energy will be supplied North Oaks by the Stillwater Division of the Consumers' Power Company, a Byllesby property. Prior to signing a five-year contract with the Consumers' Power Company, Mr. Hill had experts investigate the advisability of an isolated power plant, but eventually decided in favor of central station power.

A POWER FACTOR CHART FOR THE TWO WATTMETER METHOD WITH BALANCED LOADS.

BY JOHN WILLIAMS DAVIS.

The chart (Fig. 1) which is to be used for determining the power factors at which the different meters are operating when the power in a three-phase balanced system is measured by the two wattmeter method, consists of two curves.

Curve 1, the watt ratio curve, shows the relation between the aggregate power factor of the three-phase load and the ratio of the two wattmeter readings. This method of determining three-phase power factor by means of two wattmeter readings was given in an article by Nicholas Stahl in the Electrical World August 29, 1908.

The equation of the curve may be deduced as follows: Let the two wattmeters be connected with their current coils in lines A and C (Fig. 2) and their potential coils between A, B, and C, B respectively. Let the load be balanced and let the angle of the neutral voltages ahead of the line currents be represented by θ.

Let $q = \cos\theta$ = aggregate power factor.
r = ratio of wattmeter readings.

Then $W_1 = I_a E_{ab} \cos(\theta + 30°)$.
$W_2 = I_c E_{cb} \cos(\theta - 30°)$.

$$r = \frac{W_1}{W_2} = \frac{I_a E_{ab} [\cos\theta \cos 30° - \sin\theta \sin 30°]}{I_c E_{cb} [\cos\theta \cos 30° + \sin\theta \sin 30°]}$$

$$r = \frac{\frac{1}{2}\sqrt{3}\,q - \frac{1}{2}\sqrt{1-q^2}}{\frac{1}{2}\sqrt{3}\,q + \frac{1}{2}\sqrt{1-q^2}}$$

Clearing of fractions and collecting like terms

$$\sqrt{1-q^2}\,(1+r) = \sqrt{3}\,q\,(1-r).$$

squaring

$$(1-q^2)\,(1+r)^2 = 3q^2\,(1-r)^2$$

$$q = \frac{1+r}{\sqrt{(1+r)^2 + 3(1-r)^2}} = \frac{1}{\sqrt{1 + 3\left(\frac{1-r}{1+r}\right)^2}}$$

Curve 2, which is an ellipse, gives the relation between the aggregate power factor and the power factor at which each of the meters is operating.

The fact that curve 2 is an ellipse was demonstrated by Professor William F. Durand of the Leland Stanford Junior University.

Using the same figure as in the preceding deduction we have the following proof:

p_1 = power factor in wattmeter 1.
p_2 = power factor in wattmeter 2.
p = power factor in either meter.

Then

$p_1 = \cos(\theta + 30°) = \cos\theta \cos 30° - \sin\theta \sin 30°$.
$p_2 = \cos(\theta - 30°) = \cos\theta \cos 30° + \sin\theta \sin 30°$.
$p = \frac{1}{2}\sqrt{3} \cos\theta + \frac{1}{2}\sin\theta$.

Denoting the aggregate power factor or $\cos\theta$ by q we have

$p = \frac{1}{2}\sqrt{3}q + \frac{1}{2}\sqrt{1-q^2}$.
$2p = \sqrt{3}q + \sqrt{1-q^2}$.

squaring

$4q^2 - 4\sqrt{3}\,pq + 4p^2 = 1$.

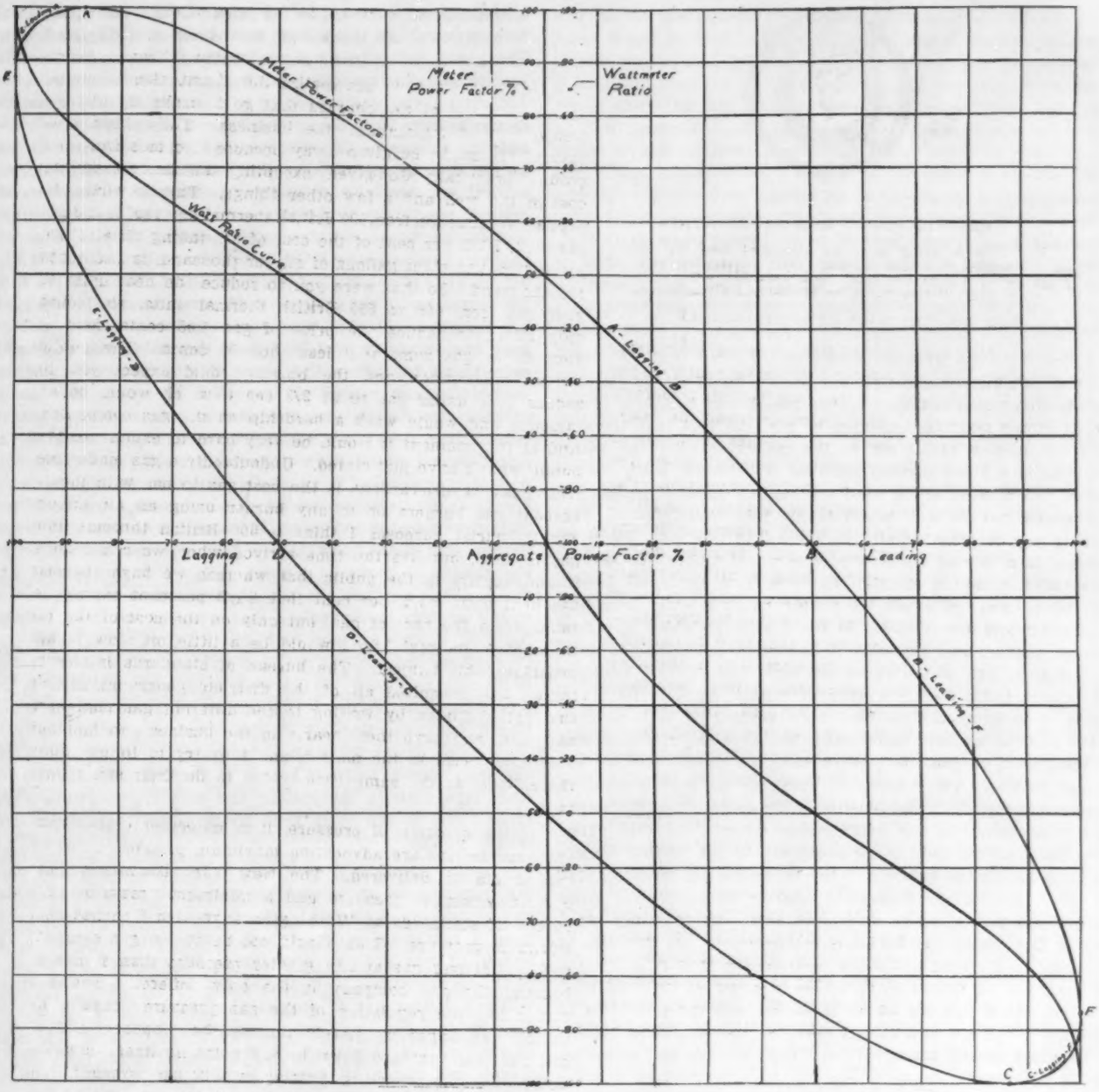


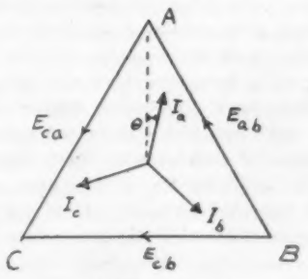
Fig. 1. Power Factor Chart for Meters Used in Measuring Power in Three Phase Balanced System by the Two Wattmeter Method

This is an equation of the second degree in two variables and it is easily shown that it is an ellipse with axes making an angle of 45 degrees with the p axis.

Application.

Suppose for instance that two wattmeters connected to a balanced three-phase load read 1000 and 400 watts respectively. Finding the point corresponding to the ratio of these readings (40) on the vertical scale we pass across to the watt-ratio curve and read off the aggregate power factor of .804. We now determine the power factor at which two meters are operating from the two points on the ellipse which correspond to this aggregate power factor. In this case the power factors are .993 and .398.

A knowledge of these power factors is useful in determining the corrections to be applied to the watt-meter readings as such corrections vary with the power factor as well as the load.



(Fig. 2.)

It is hardly necessary to say that these curves are equally applicable in determining the power factors at which watthour meters are operating.

PACIFIC COAST GAS ASSOCIATION.

(The following pages are abstracted from the discussions of papers at the Pacific Coast Gas Association Convention, which have been just made available for publication. The sub-heads are the names of the papers discussed, all of which have appeared in previous issues of this journal.—The Editors.)

Oil Gas.

E. C. Jones—Aside from the production of marsh gas synthetically, which has been proven possible up to nearly 44 per cent of the total consumption of gas, the fact that there is enough carbon remaining in the generator after the run—carbon in a finely divided state on the checker brick—to reduce the amount of oil used for heating one-half gallon per thousand is very well worth taking into consideration. Figure for a moment what that means to any city, small or large. In a city of ordinary size it would amount to several thousand dollars a month. Three or four thousand dollars a month may be saved by simply using a little care and applying this new method to the apparatus which you now have, whether you use what is known as the "straight shot" machine or any of the variations from that type of machine. The next point that is worthy of consideration is the question of spraying the oil into the machine. It is something that none of us have understood. We have experimented and have gotten results. But never have we known why we get these results. The results of spraying oil into generators are as contradictory and elusive as the operation of the steam jet exhauster. In the experiments covered by this paper we find that the only thing necessary to get perfect results is to maintain the velocity of the vaporized oil, meaning that if you vaporize oil through a quarter inch opening, from the liquid into a spray or fog, that the spray or fog must enter the generator to be converted into gas through a quarter inch opening. It does not matter if it is a quarter of an inch, or three-eighths of an inch, or an inch, as long as the orifice through which it passes into the generator is exactly the same size as the spraying or vaporizing orifice. The paper is well worth studying that we may get better results for our stockholders.

Standards of Quality and Service for Oil Gas.

E. C. Jones:—I have carefully considered the suggestion to have the matter of quality, standard and pressure, referred to a committee. For nearly a year the United States Bureau of standards at Washington has been engaged in the revision of what is known as circular number 32, having to do entirely with the standards of quality and pressure of gas. The American Gas Institute took this matter up a year ago and appointed a committee to confer with the bureau of standards and I happened to be a member of that committee. During the revision of the circular I was in communication with the chief of the bureau of standards at Washington, and the question arose—what shall be the proper heat unit standard of gas to be sold for any purpose? I am on record as advocating 550 British thermal units per cubic foot. European standards are even lower. Mr. Papst has suggested as low as 500 British thermal units and I believe he is right. But the country is not ripe for it at this moment. This is what will happen. When the chief of the bureau of standards at Washington asked me about reducing the standard from 600 to 500, he added a rider. He said, "Of course, there will be a proportional decrease in the price of gas." Now, that word "proportional" is the nigger in the fence. Stop and think. The public today does not realize the difference between the cost of gas and the selling price of gas. Some people cannot understand why gas cannot be sold at slightly above its cost in the holder. They do not realize the distribution expenses and the volume of the charges that go to make up the immense cost of maintaining the business. They think that natural gas might be given away because it comes from the ground, practically God-given, excepting the interest on the cost of the well and a few other things. This is what will happen. A reduction from 600 British thermal units to 550 is 8 1/3 per cent, 8 1/3 per cent of the cost of oil, taking oil at 68½c per barrel, and eight gallons of oil per thousand, is 1.08 cents per thousand. So that were you to reduce the heat units of your gas from 600 to 550 British thermal units, you could only afford to reduce the price of gas 1.08 cents, making your dollar gas something less than 99 cents. The public service commission and the bureau would expect you to reduce your dollar gas to 91 2/3 cents, which would be an injustice and would work a hardship on the gas companies. And at this moment it would be very hard to explain to the public what I have just stated. Undoubtedly a gas made free from heavy hydro-carbons is the best gas to use with incandescent gas burners or in any burner using an air mixer. For industrial purposes I think a 500 British thermal unit gas is ideal, but has the time arrived when we can reduce it and explain to the public that whereas we have reduced the heat units 8 1/3 per cent that 8 1/3 per cent cannot be taken from the cost of gas, but only on the cost of the oil in making the gas? So I would be a little bit slow in approaching this subject. The bureau of standards in Washington has consulted all of the districts geographically of the United States by writing to the different gas engineers and men who have their hearts in the business, to find out what they wish in the matter, and they try to follow along these lines, at the same time trying to do their strict duty to the public.

In the question of pressure, it is unfortunate that eastern commissions are advocating maximum pressure at which gas should be delivered. The New York commission has fixed a maximum pressure and a minimum pressure. The bureau of standards at Washington advocates 6 inches as a minimum pressure. This should not be so. A gas company will not deliver gas at any greater pressure than it has to, because the gas company is the only sufferer. The consumer has the regulation of the gas pressure between his thumb and finger by merely turning the stopcock, and he can shut the pressure down to any point he likes. Besides, he has an extra check by putting in a house governor if he pleases and thus reduce the pressure to any standard he pleases. But when the company raises its pressure it increases its leakage. The consumer should understand the advantages of high pressure. When the company increases the pressure it gives the consumer any quantity of the commodity for any kind of use, and at the present day it is sometimes desirable to have a very large quantity of gas through an ordinary sized pipe in a very short period of time. I think it will land us here: That in the near future the maximum pressure requirement will be removed, and it will reduce itself to the introduction of a house governor for every consumer. Then we will find, with the introduction of incandescent gas burners, medium pressure burners, and the use of gas for industrial purposes, that the consumer will realize the advantages of high pressure, and he will not put in a governor but will have it removed if he has one. I think we as individuals should post ourselves as to the advantages of high pressure—as an advantage to the consumer and not to the company. Of course, the company reaps some little advantage in the greater carrying capacity

of its mains. But we should be ready with an answer to the question of how much more efficiency do we get out of an appliance with 8 in. pressure than we do with 6 in. pressure, and then the consumer will adopt the higher pressure and reap the advantages of it.

John A. Britton:—It may be interesting to give the members the rules adopted by the railroad commission of Wisconsin no later than August 9th of this year in passing on the question of the testing of meters, and the time of life permitted to a meter in place. It is given at 48 months. In San Francisco we allow it to remain for 60 months. It goes on to determine the required heat value and it fixes the maximum in that state at 600 and the minimum at 550 under the ordinary standard conditions of temperature and pressure. "Gas pressure, as measured at the outlet of the company's service to any consumer, shall never be less than 2 in. nor more than 6 in. of water pressure, and the maximum pressure at any such outlet on the system shall never be greater than double the minimum pressure at that outlet."

"In no case shall the gas contain more than 30 grains of total sulphur per 100 cubic feet, and not more than a trace of sulphur as sulphuretted hydrogen."

They have gone to that very low pressure which would be entirely inadequate in our state, and I agree with Mr. Papst that the states of the Pacific Coast should take action.

Modern Gas Distribution and the Part Played by the Automobile.

Leon B. Jones:—The only portion of Mr. Kepplemann's paper that I am at all fitted to discuss is the welding portion. Since my paper last year in which I brought out a few of the facts of the work with the method of oxy-acetylene welding, Mr. Kepplemann has brought it to such a practical state of perfection that today every foot of high pressure installation in San Francisco is done by the oxy-acetylene process. That not only applies to the high pressure mains, but it also has been brought in quite recently in the connecting of manifolds for installing large meter connections in apartment houses where there are two or three hundred meters set and where it necessitated expensive fittings. That is, where a 4 or 6 in. manifold would be used, every meter would require 4 or 6 fittings and a 1 in. tee for an inlet and outlet. Now, the manifolds are straight pieces of pipe in which a hole is drilled and the meter connection is shoved up into the manifold. In that way the expense of making these connections is eliminated. In that way welding has not only taken its place in the field of high pressure distribution, but in the shop work all the details of labor have been eliminated to such an extent that it is now considered a necessity to the distribution department.

E. C. Jones:—I want to tell you of a piece of work done by Mr. Kepplemann under trying conditions. We have had, as you know, troubles with our help in the gas company resulting in a strike which has probably been the most extensive strike in any gas or electric company in the world. A few nights ago a telephone message came in between 1 and 2 o'clock in the morning that there was a high pressure leak on the outskirts of San Francisco near the county line between San Francisco and San Mateo county. In 20 minutes after the word was received by Mr. Kepplemann he was on the job with a gang of men and found that three holes had been punctured into the 6 in. high pressure line carrying 75 lb. pressure. The gas had been ignited and the flames from the holes extended to a height of probably 25 ft., uniting at the top into one fan-shaped flame, illuminating the entire neighborhood, and the roar of the fire could be heard for blocks. The work was done by miscreants who made use of the substance known as thermit which has been extensively used for the welding of cast iron and steel. The thermit was placed on top of the main in four places, close together, and ignited, burning holes through the steel pipe, and as the gas issued from the hole it ignited. One of the holes failed to work. Three of them ignited, causing an immense loss of gas and it seemed when I got on the ground that it was really a tough job to put out the fire. The line which had been tampered with supplies the southern portion of San Francisco with high pressure gas and also all the towns on the peninsula, extending as far south as Palo Alto, and it was impossible at 2 o'clock in the morning to shut the pressure off the line, having on it thousands of consumers with water heaters and pilot lights, bath room lights and all manner of night lights, which it would have been a crime to have extinguished. The question arose, how should we extinguish this flame, because without putting it out it was impossible to stop the flow of gas and to make repairs. Mr. Kepplemann sent an automobile truck into the city yard and got a length of 6 in. steel tubing 20 ft. long, with some rope, and placed the tubing on the ground at right angles to the holes, the holes being three-quarters of an inch in diameter. We reduced the pressure from 75 to 50 pounds on the line, knowing that this pressure would carry with perfect safety. Guy-ropes were fastened near the other end of the 6 in. pipe for the purpose of raising it to a perpendicular position. It was raised by these guy-ropes until it stood directly on top of the 6 in. pressure line and enclosed the leaks. It only took an instant to stop the fire at that point because of the impossibility of air getting to it. So after the 6 in. pipe dropped on the flame at its smallest point at the bottom, in a second the flame shot from the top of the stand-pipe and the moment it was seen that all the flame was coming out of the top of the stand-pipe, word was given to let go of the guy-ropes and the pipe was thrown clear of the high pressure line, carrying with it the flame. The gas flame issued from the end of the 6 in. pipe on the ground for half a second or maybe a full second and burned the gas that was in it, but the flame from the high pressure line was extinguished. We then had some soft pine plugs 4 ft. long prepared and driven into the holes and cut off, and the pipe was bandaged with three-inch tape, something similar to tire tape, till the gas leak was entirely stopped. The pressure was then raised on the line and no consumers knew that there had been trouble of any kind. In fact, there was no interruption of the service. I mention the fact to show the necessity of having quick means of getting to a job. Twenty minutes from the time the police reported this leak, our men were there with automobiles and it took but a few minutes more to go into town and get the length of pipe and the ropes and bring them out on the job. It could not have been accomplished with horses.

Another thing I want to call your attention to is the necessity for the employment of resourceful men. A man of the calibre of Mr. Kepplemann can save his salary in a very few minutes. I have often been asked how to put out a gas fire on a high pressure main. I believe I have suggested a half dozen methods and none of them worked, but this simple little thing turned the trick. If you ever have any trouble of that kind simply stand up a pipe and take the flame away. It doesn't matter what the diameter of the stand-pipe is. It may be 6 or 8 or 10 or 12 in. pipe. Any pipe that you can handle freely. Be careful not to burn your men. Don't use a coated pipe. But any size pipe will trap the flame and take it away from the leak. I want to compliment Mr. Kepplemann on his splendid paper. It is impossible to read a paper of that kind and have it thoroughly understood. I am sure the tables and illustrations will remain companions to you for years. He has calculated the cost of doing various jobs and his averages cover such a quantity of pipe that the error has been minimized and you will find the paper has valuable data as to the calculation of cost of laying mains and renewing pavements and other factors connected with pipe laying and the care of pipe.

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POWER AND GAS

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Intensive Expansion

Some central stations are alert to the necessity of inducing industries to locate favorably to their distribution systems. Wheels locked for the greater part of each day allow too much waste. The idle investment is a loss. This naturally results in a higher charge for the energy supplied and so makes the securing of new business more difficult.

Lack of business causes lack of ease, and contrary to the usual order this disease is thought to be from without rather than within. Some commendable cures have been concocted for this condition and others that are wide the mark, but all seem to suggest the saturation of the system with something new. But the need of improving load factor has not been sufficiently emphasized, and even where recognized has not been completely carried out.

Immediately there comes the counter suggestion, why study load factor when there is so great a surplus capacity? And the answer is time worn, but still true, "It is more profitable to improve load factor and hence the earning capacity of existing lines, than to extend to new business."

Every restaurant in your territory may use electric fans and you are probably proud of that fact, but has every restaurant an electrically operated dish-washing machine, vegetable peeler, refrigeration outfit or the many other power using devices which your experience will suggest? Have you taken full advantage of the improved electric vehicle opportunity? It is safe to reply, "No!" The same is true of other classes of business.

By close co-operation in any locality the electrical industry could increase business for all. Even so-called slack times should have a beneficial effect upon a business which provides invariably the more economical way. It is largely up to the central station.

The utilization of surplus power together with improved load factor and production at a cost which permits competitive selling, hinges upon willingness to make a comprehensive study of existing customers' requirements and an endeavor to completely fulfill them. They indeed profit most who serve best.

Part of the hazard of centralization consists in possible neglect. A small community served by a local steam plant may enjoy excellent service and attention. The coming of the larger corporation's distribution system annihilates or otherwise eliminates the local plant and while the community may be given a lower rate for the energy delivered it really costs more if the attention and care of their interests is neglected. Probably the larger system thinks it necessary to only send out monthly a man to read the meters and bill the consumers, for perfection of system and automatic operation exclude the human element—the corporation's real expression of service. Of course, all communities are not small and local agents may be installed, but they are not legion who measure up to the splendid standard stated in the article on The District Agent which appears in this issue. Even where a good agent is appointed he is often handicapped by rules and regulations and limitations made by men who do not understand, and so he is unable to carry out the plans he finds necessary to good service.

But by improving conditions through a more com-

plete service which really serves, you improve load factor, grasp Opportunity and so restore ease. The result is intensive expansion and growth which is self-sustaining.

Protecting the Stranger

Everyone eager for the success of the Panama-Pacific International Exposition, 1915, appreciated, at the time of its passing, the Kahn Law providing for the free importation of articles intended for foreign buildings and exhibits and for the especial protection of the foreign exhibitor against the unlawful appropriation or reproduction in the United States of his invention, copyright, trademark, and so forth.

Except by perhaps a few expert patent attorneys it was not thought that this protective measure menaced the safeguards afforded by the general laws to domestic inventions, patents, copyrights and trademarks. Such, however, is now found to be the case, although the law is in force, having been approved last September.

In its passing, it is stated that time was not taken for it to be submitted to the Patent Committee of either House of Congress or to other authorities which should have been consulted.

Apparently simple in itself and necessary to the success of the Exposition the Kahn Law makes a sieve out of existing laws and good and makes them of less effect.

The Committee on Laws and Rules of the Patent Law Association of Washington brand this "the most dangerous, ill-considered, and inexcusable law ever enacted," in this connection.

Under our general laws foreigners have the same opportunities as our citizens to obtain patents for inventions, designs, copyrights and trademark protection. While this new law which conveniently knocks a breach in the tariff wall for the more convenient entrance of exposition things, might have provided additional facilities to foreigners temporarily seeking protection it is thought that a new law and additional rights were unnecessary.

The ramifications of these patent and copyright laws are so intricate and their construction extends over so large a number of years that hastily enacted new laws on this subject seem incongruous.

Things done in haste usually have to be done over again and it is urged that pressure be brought to bear upon Washington so that this law be immediately amended. That the necessary revision will be made is a foregone conclusion, for while the stranger, or rather guest within our gates—exhibition or otherwise—must be protected, yet there is no valid reason for inflicting even a possible hardship upon legitimate domestic enterprise while generously extending that protection.

Law continues only by consent of the people, and in the last anaylsis, by virtue of what is reasonable in its demands.

It is a question whether a law which protects on the one hand and unduly persecutes on the other could be long enforced, but where the danger of injury, endless litigation and entanglement is foreseen, immediate action should be taken to restore confidence.

Double-Deck Cars

Some people are unfortunate in that they travel on street cars only during "rush" hours. "The traffic peak," they are told, "makes it impossible to supply seats for all," and so they ride standing. But strap-hanging by tired people causes discontent. This is ultimately expressed in an upheaval which occasionally results in municipal ownership. A duplicate system or additional cars are then provided, but in a comparatively short while, custom conquers and the strap-hanger is again in evidence. Peak-load traffic is so elementary, so general an annoyance to all, that it is a wonder why people imagine that a change in ownership or administration will ameliorate this untoward condition without a change in plan.

A seat for every nickel is an essential of good service.

It has been an accepted theory in the past that peak-load traffic prevented the realization of this ideal, but by combining one discarded type of car with a new idea this seat-for-all theory is not only practicable, but should prove an advantage to the transportation company also.

The arguments advanced against the adoption of double-deck cars, which are in general use throughout Europe, hinged upon the difficulty of making a quick start at the many stopping places we have for accommodation. "The conductors would be at various points either within the car or on the upper deck and accidents also would be of more frequent occurrence," ran the arguments.

Accepting these views as actually borne out by analysis, and the argments, now fail absolutely due to the practically universal adoption of the pay-as-you-enter type of car together with the push-button system of signalling the conductor.

A prepayment type of double-deck car with enclosed ends, outside safety doors, but no interior bulkhead doors, together with an efficient system of electric bell signalling would satisfactorily solve this problem and at the same time aid in relieving traffic congestion.

Contrary to the belief of those who have had no experience with this type of car they are equally satisfactory in rainy seasons as in dry. A great number of ever-dry outside car seats have been invented and have proven practicable. This overcomes the objection of the clumsy appearance which is justifiably made regarding double-deck cars which have the upper deck enclosed and roofed in.

This type of car would prove a boon to the smoker. At the present time he is required to smoke in the vestibule or in some section of the car especially provided generally more or less filthy and in either case objectionable to the non-smoker. On the upper deck of a double-deck car he is an annoyance to nobody and smokes in comfort.

In California especially, such cars would prove popular and other places would also appreciate their special advantages. Taken together with the installation of a through car service for long-distance passengers and no street railway system, municipal or otherwise, could honestly say that a seat for all is not a realizable idea.

PERSONALS

ITEMS FOR THIS DEPARTMENT ARE SOLICITED FROM ALL READERS

Hal Lauritzen, Holophane Works of General Electric Company, is at Los Angeles.

K. B. Ryan, formerly with the Vancouver Power Company, is at San Francisco.

W. G. Langdon-Davies, analyst, B. C. Electric Railway Company, was at Seattle last week.

Stanley Pearce, city electrician of Sacramento, has been appointed Jovian Statesman for that city.

W. H. Downing, erecting engineer, Arizona Copper Company, Clifton, Arizona, is at San Francisco.

R. L. Stafford, sales engineer Allis-Chalmers Company, Seattle, has returned from a business trip to Spokane.

Geo. M. Plover, manager Mark McConell Company, Santa Rosa, was a visitor at San Francisco during the past week.

Charles H. Lee, civil and hydraulic engineer, announces the removal of his offices to 1103 Central Building, Los Angeles.

G. R. G. Conway, chief electrical engineer B. C. Electric Railway Company, Vancouver, B. C., has returned from his New York trip.

Thos. Finigan, vice-president of Pierson-Rceding & Co., has returned to San Francisco from a two months' trip throughout the East.

H. C. Price, formerly chief clerk Oakland Branch Great Western Power Company, is now assistant superintendent of the Sacramento office.

E. L. Greer, formerly with the Tacoma Electric Railway Company, has entered the employ of the Pacific States Electric Company at Seattle.

Chas. C. Hillis, treasurer and general manager Electric Appliance Company, San Francisco, has returned from a trip made throughout the East.

Col. H. V. Carter, president Pacific States Electric Company, San Francisco, returned the first part of the week from a business trip to Los Angeles and the south.

S. B. Anderton, district manager of the Pacific States Electric Company, San Francisco, returned home after a month's business trip throughout the Pacific Coast territory.

S. L. Shuffleton, engineer in charge of construction for the Stone & Webster Construction Company, at the Big Creek Plant, Pacific Light & Power Company, is at San Francisco.

H. F. Lucia, at one time first assistant engineer with the Stromberg-Carlson Telephone Manufacturing Company and now with the General Railway Signal Company, is at San Francisco.

R. A. Thompson, engineer Interstate Commerce Commission, has been in Los Angeles in connection with the work to be undertaken by the commission in the valuation or railroad properties.

T. W. Selmon, treasurer of the Westinghouse Electric & Manufacturing Company, Pittsburgh, spent the past week in San Francisco and contemplates visiting the various branches enroute home.

A. M. Hunt, consulting engineer and chairman of the papers committee for the International Engineering Congress at San Francisco in 1915, has left for an extended Eastern trip in connection with the congress work.

E. M. Cutting, manager of the Edison Storage Battery Supply Company, San Francisco, has returned after an absence of six weeks or more during which he made an extended visit to various Eastern manufacturing cities.

Preston S. Millar, chairman of the Committee on Publicity of the International Electrical Congress to be held at San Francisco in 1915, announces the appointment of **O. H. Caldwell, F. H. Gale, J. C. Quiston** and **A. H. Halloran** as the other members of the committee.

John D. Orr, local manager, Idaho-Oregon Light & Power Company, at Nampa, Caldwell, Emmett, Middleton, Murphy and Silver City, wtih headquarters at Emmett, Idaho, stopped over at Salt Lake City on his return from a vacation.

H. F. Stratton, general manager and chief engineer of the Electric Controller and Mfg. Company of Cleveland, is studying alternating current motor control in Pacific Coast industries. He has visited Utah, Idaho, Washington and Oregon and is now in San Francisco, whence he will proceed to Los Angeles.

Henry L. Doherty is now chairman of the board of directors of the Denver Gas & Electric Company. In the reorganization the following changes have also been made: **Frank Frueauff,** president, was formerly vice-president and general manager; **W. G. Barker,** formerly second vice-president and general superintendent, is made vice-president and general manager; **E. E. McWhinney** is appointed assistant secretary, and **W. P. Troth** assistant treasurer.

MEETING NOTICES.

San Francisco Section, A. I. E. E.

The regular November meeting will be held Friday, December 5th, in the hall of the Native Sons of the Golden West, 430 Mason street. The paper of the evening will be a General Description of the Drum Development of the Pacific Gas and Electric Company, with Particular Reference to the Economic Conditions Governing the Engineering Design, and will be presented by Rudolph W. Van Norden.

Jovian League at Los Angeles.

The Jovian Electrical League of Southern California held a meeting at Christophers, Los Angeles, last Wednesday. The chairman of the day, Mr. H. B. Linch, introduced Mr. H. B. Fisher, manager Lecture Bureau, Panama-Pacific International Exposition, who then gave an illustrated talk on "What the Exposition Means to the State." There was considerable interest evinced and the attendance was good. Entertainment was also provided by a soloist and caricature comedian.

Utah Light and Railway Section, N. E. L. A.

The Utah Light and Railway Company Section, National Electric Light Association, held their first banquet of the season at the Welcome Cafeteria, Tuesday, November 18th. During the dinner a musical program was furnished by the Split Phase Quartet, under the direction of William Turner, who introduced some amusing electrical stunts with their songs. Those contributing to the program were Harry Dunbar, Will Emery, H. G. Fisher, Wm. Scott, E. C. Cathcart, Eugene Wellman and T. W. Keyworth.

San Francisco Electrical Development and Jovian League.

The subject of Load Factor Building was presented in an interesting address by Mr. R. B. Mateer at the regular meeting last Tuesday held at Tait's Cafe. Mr. Mateer has made a close study of this subject and placed clearly before the meeting the results both of his observation and experience. The important bearing of co-operation between all manufacturers, jobbers, dealers and the central station was emphasized, also the importance of carefully building up the business by the central station inaugurating and continuing a methodical canvass and educational campaign, and the means to that end were also touched upon.

Oregon Electrical Contractors' Association.

The Oregon Electrical Contractors' Association, after a vast amount of labor, has completed a "Price List of Electrical Supplies" for Oregon. The book will be off the press about December 1, 1913. It is made in loose leaf form and can be bound with the universal data and sales book issued by the National Electrical Contractors' Association. It will contain approximately 50 pages printed on both sides.

There is also incorporated in this book besides all supplies and material used in electrical contracting business, the retail price of same, notes on the local and National Electrical Contractors' Association, and much useful data compiled in the form of tables for contractors' use.

A copy of this book will be mailed to each member of the California State Association and each member of the Oregon Association. In addition there will be mailed a copy to each electrical contractor, who is not a member of the association in the states of Washington and Oregon, and doubtless this mailing list will not be complete, therefore if any electric contractor in the states of Oregon or Washington does not receive a copy he may obtain same by making a request to Mr. F. C. Green, 291 E. Morrison street, Portland, Oregon.

The Society for Electrical Development.

Forty-one manufacturers have taken out membership in the Society for Electrical Development, aggregating over $80,000 annually as their subscription to this very important trade movement. The particular group of forty-one referred to are members of the Electrical Manufacturers' Club, at whose meeting recently in Hot Springs the Society was a live topic of discussion both in the meeting and the lobbies. The affiliation with the Society of the other members of the Club is being carefully considered, and their co-operation will undoubtedly raise the subscriptions from this particular group to over $100,000 annually.

The President of the Club, S. O. Richardson Jr., in introducing the subject, gave the movement his warm personal endorsement, backed by the statement that his interests, the Libbey Glass Company, joined some months ago. J. Robert Crouse, emphasized the basic principles involved with special reference to the manufacturers. Gerard Swope, vice-president of the Western Electric Company, followed, explaining the detail plan of organization and the balanced representation of the grand divisions of the business. He expressed the opinion that the plan and personnel of the officers and directors gave every promise of efficient and economical expenditure in the work.

F. S. Terry, manager of the National Lamp Works, addressed the meeting with reference to results which the Society can accomplish. He explained that the result of the earlier efforts in this same work in 1906 and 1907 had greatly exceeded expectations, and indicated an efficiency in market development by these methods which cannot be attained in any other way.

During the meeting, President Richardson received over fifty telegrams from electrical supply jobbers in all parts of the country, stating they were members, expressing their conviction of its value and the hope that all the manufacturers would join in the movement.

There are, of course, many manufacturers not members of the Electrical Manufacturers' Club, so that the figures given in the beginning of this paper are less than the actual.

The Society's objects, plans and methods of membership need only to be really understood to make a successful appeal to those who have not yet joined as it has done to the 700 and more companies in membership. It is in effect a wonderful opportunity for the electrical business to blaze a new trail in creative market development that will be in keeping with the great achievements in electrical research, engineering and manufacture. A pamphlet covering concisely the principles, plans and method of membership will be gladly sent, on request to the Society for Electrical Development, Engineering Societies Building, New York.

Directors' Meeting, A. I. E. E.

The regular monthly meeting of the board of directors of the American Institute of Electrical Engineers was held in New York on Friday, November 14, 1913, at 3:30 p. m.

President Mailloux announced the acceptance of Dr. C. P. Steinmetz of the appointment of honorary president of the International Electrical Congress, and the acceptance of Dr. E. B. Rosa as honorary secretary, which appointments had been authorized by the board at its October meeting.

President Mailloux further reported that the reorganization of the executive committee of the committee on organization of the congress had been completed, as follows:

Charles P. Steinmetz, honorary president of congress; E. B. Rosa, honorary secretary of congress; H. G. Stott, chairman; John W. Lieb Jr., vice-chairman; C. O. Mailloux, chairman sub-committee on International Relations; A. E. Kennelly, chairman sub-committee on program; Henry A. Lardner, chairman sub-committee on Pacific Coast Relations; H. H. Barnes Jr., chairman sub-committee on Transportation; George F. Sever, chairman sub-committee on Entertainment; Preston S. Millar, secretary-treasurer and chairman sub-committee on Publicity; F. L. Hutchinson, secretary A. I. E. E. (ex-officio).

Upon the recommendation of the Meetings and Papers Committee, the board authorized the following meetings in addition to the New York monthly meetings and the midwinter and annual conventions:

Institute meeting in Washington, D. C., April 10, 1914, under the auspices of the Electrophysics Committee.

Institute meeting in Pittsburgh, Pa., April 23-24, 1914, under the auspices of the Pittsburgh Section and the Committee on the Use of Electricity in Mines.

Institute meeting in Pittsfield, Mass., under the auspices of the Pittsfield Section.

Pacific Coast meeting in Spokane, Washington, September, 1914.

Upon the recommendation of the board of examiners, the following action was taken upon pending applications for election and transfer:

Thirty-five applicants were elected Associates.

One hundred and sixty-five students were ordered enrolled.

Elected to the grade of Member: Frederic S. Burroughs, Joseph P. Catlin, Max Hebgen, Thomas J. MacKavanagh, Robert Shand, Thomas A. Sproule.

Transferred to the grade of Member: Evan J. Edwards, L. S. F. Grant, J. D. Hathaway, W. R. Putnam, Henry H. Sinclair, Herbert W. Smith.

Transferred to the grade of Fellow: George A. Campbell, J. Paulding Edwards, J. L. Harper, John P. Mallet, D. B. Rushmore, E. F. Scattergood.

President Mailloux referred to the death on November 6th by Sir William Henry Preece, who had been an honorary member of the Institute since 1884, and suitable resolutions, previously prepared by a special committee which President Mailloux had appointed, were presented and unanimously adopted.

The president was authorized to appoint three representatives of the Institute upon the recently organized U. S. National Committee of the International Commission, and $100 was appropriated as the institute's one-third share of the U. S. National Committee's contribution towards the expenses of the commission. The other bodies represented on the committee are the American Gas Institute and the Illuminating Engineering Society.

The following committee appointments were announced by the president and confirmed by the board:

Railway Committee: Frank J. Sprague, chairman; E. B. Katte, vice-chairman; A. H. Armstrong, F. W. Carter, Frederick Darlington, W. A. Del Mar, C. E. Eveleth, W. S. Gorsuch, Hugh Hazelton, E. R. Hill, W. S. Murray, A. S. Richey, Clarence Renshaw, Martin Schreiber, N. W. Storer, B. F. Wood.

Committee on Electric Illumination: Clayton H. Sharp, chairman; Louis Bell, Frank Conrad, J. W. Cowles, E. P. Hyde, A. E. Kennelly, C. F. Lacombe, I. Langmuir, V. R. Lansingh, Preston S. Millar, E. B. Rosa, W. D.'A. Ryan, G. H. Stickney

INDUSTRIAL

POWERFUL ELECTRIC LOCOMOTIVES.

The New York Central and Hudson River Railroad Company recently ordered six additional powerful passenger electric locomotives from the General Electric Company for terminal service out of New York City. Early in the year ten electric locomotives of the most powerful type ever built were ordered from this company for the same service. These weigh 100 tons each. While the new machines are of the same type and construction, they are somewhat heavier, weighing 110 tons, and due to recent advancement in locomotive design, have materially increased capacity for continuous service.

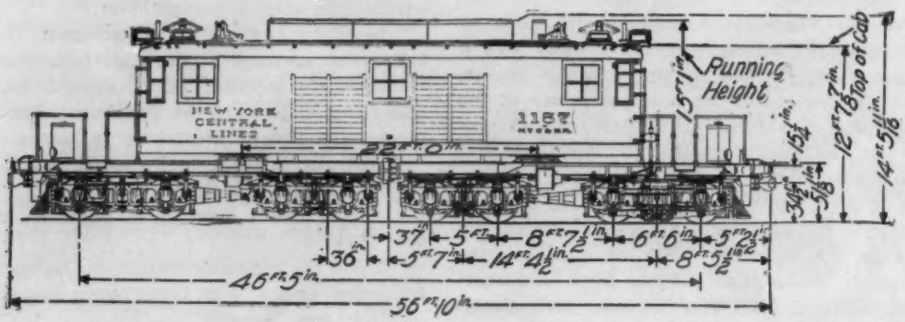
The growth in traffic and the corresponding increase in the demand for larger and heavier train units since the introduction of electric locomotives in the New York Central Terminal has been indeed notable. In 1906 thirty-five 600 volt, direct current passenger electric locomotives were built by the General Electric Company and introduced in the terminal. These machines are of the 115-ton, 4-8-4 type, and are each equipped with four GE-84 bipolar, gearless motors. Twelve more engines of the same type were placed in service in 1908. All these locomotives were designed with sufficient tractive effort to operate 535-ton gross weight trains at 60 miles per hour in the regular terminal service.

The ten 100-ton electric locomotives ordered the fore part of this year are designated type 4-4-4-4 and are each equipped with eight GE-89 bipolar, gearless motors, all the weight of the machine being carried on motor-driven axles. These engines are designed for pulling the heavy limited trains and will exert sufficient tractive effort to operate 800-ton trains in continual service between the New York Central terminal station and Harmon. They are capable of operating a 1000-ton train in emergency service or a train of the same gross weight on level tangent track continuously, at 60 miles per hour, or an 800-ton train at 65 miles per hour.

But the weight of trains which are being hauled out of the terminal is ever increasing steadily, and some of the more important trains now weigh over 1000 tons. It has therefore been deemed desirable to have engines for the maximum service with very great continuous capacity, ample overload and high momentary rating. The new locomotives are able to exert practically the same tractive effort continuously that the previous ten locomotives can for one hour.

The ten tons' increase in weight in these machines is accounted for mainly by the greater amount of material in the motors, which are of larger capacity. The speed and torque characteristics of the locomotive have been kept practically the same as those of the former ten machines, but the new locomotives are capable of hauling approximately 40 per cent. greater tonnage in continuous service.

The previous ten 100-ton locomotives have a capacity for developing 1460 horsepower continuously, 3000 horsepower for one hour and can develop as high as 5000 horsepower for short periods. This corresponds to a tractive effort of 9000 pounds at 60 miles per hour continuously, or 13,500 pounds at 54 miles per hour at the one hour rating. The six new electric engines will develop 2000 horsepower continuously, or 2600 horsepower for one hour. The equivalent tractive effort is 14,000 pounds at 54 miles per hour continuously, or 20,000 pounds at 49 miles per hour at the one hour rating. They are able to haul 1100-ton trains in continual service between the terminal and Harmon, are capable of operating 1200-ton trains in emergency service, and 1200-ton trains on level tangent track continuously at 60 miles per hour.

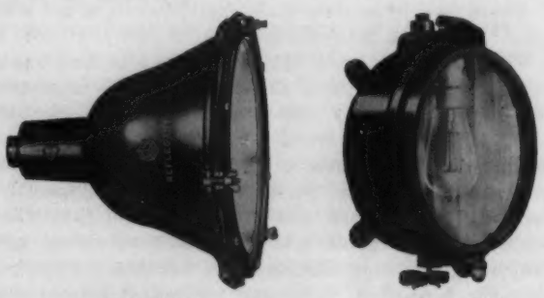


Dimensional Details New York Central Electric Locomotives.

In point of design and construction the new machines will be of identically the same type as the former ten engines, having an articulated frame with bogie guiding trucks at each end. The cab containing the engineer's compartment and that for the operating mechanism is swung between the two parts of the frame on center pins. Each section is equipped with two-axle trucks having a driving motor mounted on each axle. All the axles are therefore driving axles, and the eight motors, of the bipolar gearless type, are of the same general design as the motors on all the previous 57 locomotives, and are provided with ample forced air ventilation.

NEW REFLECTORS AND HOW TO USE THEM.

The Crouse-Hinds Company of Syracuse, N. Y., has issued a bulletin devoted to Reflectors for use in roundhouses, steel mills, etc. The bulletin also contains instructions as to how



Type RS. Type RM.

and where reflectors should be mounted, to give the maximum amount of light where needed.

These reflectors are in two general styles. One, type RM, is not unlike, in appearance, an electric car headlight, and the other, type RS, is bell-shaped. Both have castiron cases and are gasketed, to make them gas, dust and weather-proof.

NEWS NOTES

ILLUMINATION.

CATHLAMET, WASH.—The city council has granted a 25-year franchise to Ingalls Bros. for furnishing Cathlamet with electric light. The terms of the franchise provide for a 10-year street lighting contract.

SAN BERNARDINO, CAL.—The city council has abandoned plans for a municipal electric railway, city hall and park site for the time being, but will proceed to secure a municipal electric light distribution system as soon as possible.

ARTESIA, CAL.—The Downey Light & Power Company has submitted a proposition to the Artesia Board of Trustees, relative to installing an electric lighting system in Artesia. The entire board has been appointed as a committee to investigate the matter.

SEATTLE, WASH.—Plans will be prepared under the direction of Superintendent of Lighting, Ross for construction of the first unit of the $450,000 auxiliary steam plant for the lighting department on Lake Union. This portion of the work will cost $100,000.

SEASIDE, ORE.—The Seaside Light & Power Company has been granted a 30-year franchise for operating an electric line in the city of Clatsop. The territory covered by this franchise is from the north boundary of Gearhart Park to the south boundary of Warrenton.

SAN ANDREAS, CAL.—The Pacific Gas & Electric Company has been awarded the contract to install and maintain poles, wires and all other accessories complete for the supplying of electric current for the Mokelumne Hill Lighting District of Calaveras county for a term of 5 years.

TILLAMOOK, ORE.—The ordinance relative to an electric light and power franchise which Messrs. Small and Urie are desirous of securing, was taken up for discussion. The site has been secured up the Trask river and the county has granted the company a 30-year franchise. A franchise from the city of Tillamook is now desired.

TRANSMISSION.

BREMERTON,, WASH.—At a meeting of the Bremerton city council W. D. Peters, a local attorney, appearing for promoters, offered to build a light and power plant to cost $288,000, which will be turned over to the city at the end of two years.

SEATTLE, WASH.—The Puget Sound Traction, Light & Power Company has filed an application for a franchise to construct and operate lines of poles with all necessary appurtenances for the conveyance of electric power, over roads, streets and other public places in King county.

SANDY, ORE.—An ordinance was read by the city council granting a five-year franchise to A. W. Botkin and Michael McCormick to supply this town with electric lights and power, the electricity to be developed at a plant under construction on Cedar Creek. The ordinance will come up for final passage at the January meeting of the council.

SAN FRANCISCO, CAL.—A resolution granting the Pacific Gas & Electric Company permission to erect certain poles for power line purposes was amended so as to secure to the city the right to use the poles free of charge and upon payment of proper proportion of the cost, or a rental, the right of any other electric power company to the use of the poles.

WOODLAND, CAL.—In order to determine the status of the case, the state water commission visited the Yolo Water & Power Company's plant in Lake and Yolo counties. The commission recently heard protests from ranchers in the two counties against the installation of a dam in Clear Lake by the power company. Attorney A. C. Huston of the power company, conducted the commission over the property.

AURORA, ORE.—The Aurora Electric Company has closed a deal by which it transfers its system to the Molalla Electric Company, an organization recently incorporated and which has also taken over the Molalla Power Company and the interests of the Canby Canal Company in the power plant on the Molalla River. It is reported that the company will issue bonds in a large amount to cover the cost of improvements.

OAKLAND, CAL.—An ordinance has been passed by the city council declaring in favor of the calling of an election for the purpose of securing a vote on the public utilities question. A public hearing will be held when both proponents and protestants of the plan to place in the hands of the railroad commission the control of all public utilities will be heard. City Attorney Woolner is arranging a specific ordinance setting the date for the calling of an election.

LOS ANGELES, CAL.—Rejecting the proposal of the power companies to lease their systems to the city with a view to ultimate purchase without additional bonded debt, the public service commission has framed a counter proposal, standing for immediate purchase, with submission to the railroad commission of the price to be agreed upon. The city council is in favor of calling a bond election immediately to secure funds to take over the distribution systems at once.

TRANSPORATION.

SEATTLE, WASH.—Bids will be received until November 28th for furnishing labor and material for the construction of one substation for the municipal street railway, Division A, to be built in Eden's addition.

BURNABY, B. C.—The board of works has decided to request New Westminster and Coquillam to appoint committees to co-operate with Burnaby in urging the B. C. Electric Company to proceed with the projected Sapperton and Coquitlam line.

OAKLAND, CAL.—Suit to recover $92,000 alleged to have been advanced to the United Properties Company was instituted by W. S. Tevis and R. G. Hanford who sought also to attach the Oakland Traction, a subsidiary company, for the amount.

TACOMA, WASH.—The council has voted to call an election at which $100,000 worth of bonds for a municipally owned and operated line across the Lincoln bridge to the tide flats will be placed before the people. The election will be some time in December.

STOCKTON, CAL.—Coincident with action of the new board of directors of the Stockton Terminal & Eastern Railway Company the word that the railroad will be placed in new hands and that active and aggressive work toward the early completion of the line to Jenny Lind, east of Stockton, and the establishment of a terminal on the Stockton waterfront will be started.

PORTLAND, ORE.—The city commissioners have granted a 25-year franchise to the Portland & Oregon City Railway Company, a new corporation headed by Stephen Carver, for an interurban electric franchise from the city limits on East Seventeenth street to the West Side business district by way of Hawthorn bridge and Fourth street. President Carver announced that work will be rushed to completion.

RED LODGE, MONT.—Consideration has been given by a committee of the Red Lodge Commercial Club to the construction of an electric line over the hill to connect Bear-

creek and Washoe by rail with Red Lodge. Articles of incorporation were filed, and a contract closed with A. J. Showalter, an Idaho promoter, to float the proposition by raising $100,000 in stock subscriptions on a commission basis. The capital stock is placed at $225,000, divided into shares of $100 each. The company will place $100,000 worth of stock on the market. Engineer Gibson will proceed with the survey.

SAN FRANCISCO, CAL.—A union electric railway depot at Eleventh and Mission streets, where local and suburban lines will meet at a central transfer point, is a plan now being worked out by municipal and railway officials. The lines involved, in operation and in prospect, according to the plans, are the San Mateo electric system, the Ocean Shore, the old Southern Pacific loop, which is to be electrified for suburban service, the Van Ness and Potrero avenue Municipal line and the Twin Peaks tunnel line, which will give service to the Parkside and other districts, along the ocean shore. The plan suggested itself to the city attorney through the request of the Ocean Shore line to cross Mission street and make use of its property, now used as a football field, for a depot.

SAN FRANCISCO, CAL.—City Engineer O'Shaughnessy reported to the board of public works last Monday that by December 1 he would have specifications ready for bids for furnishing cars, rails and other equipment for the extensions of the municipal railway system. He knows of no reason, he says, why the contracts should not be let about January 1. His estimate of the cost is $1,280,000. He estimates that $150,000 will be needed for the new carbarn and $350,000 for the purchase of equipment belonging to the Presidio and Ferries Railroad which will be of use to the city, the franchise of the company lapsing on December 11, making $1,780,000 in all that should be provided. The equipment items are as follows: Rails, rail joints and fastenings, $250,000; tie rods and nuts, $5000; tie plates, $20,000; rail spikes, $5000; redwood cross ties, $10,000; copper rail bonds, $10,000; track special work, $200,000; trolley poles, $40,000; street cars, $700,000; total $1,280,000.

OAKLAND, CAL.—To wage an active campaign for a central traction depot at Fourteenth and Franklin streets on the site of the present Southern Pacific local station, a committee, authorized by the Chamber of Commerce directors at their meeting last week, is announced by President W. E. Gibson. The committee consists of former Secretary of the Navy Victor Metcalf; former Governor Geo. C. Pardee, H. C. Capwell, Walter Leimert, Fred. Kahn, Jos. King, Jules Abrahamson and W. J. Laymance. The committee will hold meetings at once with Metcalf as chairman, and will, as soon as details are ready, turn over a proposition to Secretary A. A. Denison of the chamber to lay before the Southern Pacific Company. The project of a central depot was taken up a year ago by Metcalf, and later Secretary Denison in several conferences with railroad officials, secured a tentative consideration of the matter. A conference between the committee, Paul Shoup and E. E. Calvin will be called to further discuss the plan after Denison's date has been considered by the organization.

TELEPHONE AND TELEGRAPH.

CLOVERDALE, CAL.—Commissioner Thelen presided at the hearing of the California Telephone & Light Company, which operates in and around Cloverdale, for authority to issue $100,000 additional first mortgage 6 per cent bonds and $50,000 of stock. F. L. Wright, president and general manager, testified that since March 1st last the company has expended $47,398 in new construction, extensions and improvement of plant. Of this sum $15,225 was the remainder of the proceeds of a prior bond sale and the balance was taken from earnings. The company has filed with the commission a comprehensive engineering plan for the development of its field of enterprise in northern Sonoma county. Authority is asked to sell this allotment of bonds at 94 and the stock at 80, though no underwriting contract has as yet been signed.

SAN FRANCISCO, CAL.—The Nevada, California & Oregon Telephone & Telegraph Company has applied to the commission for authority to issue $27,500 of bonds. Of these bonds, $20,000 will be used to acquire the properties of the California & Oregon Telegraph Company, and $7500 will be used to pay off existing indebtedness. The former company conducts a telegraph business in Nevada, California and Oregon. The lines extend from Reno, Nev., to Lakeview, Ore., and pass through portions of Lassen and Modoc counties, Cal. The California & Oregon Telephone Company serves adjoining territory, including portions of Modoc, Lassen, Plumas and Sierra counties, in California.

WATERWORKS.

ANTIOCH, CAL.—The $25,000 bond issue for the improvement of the municipal water system was approved by the voters of this city.

LOS ANGELES, CAL.—Authority has been granted to the Indio Light, Water & Ice Company to sell its water supply plant at Indio, Riverside county, to H. E. Gard.

REEDLEY, CAL.—Sealed bids will be received up to December 16th, for the sale of the bonds of this city as follows: $40,000 for sewer system and $32,000 water bonds.

SAN DIMAS, CAL.—The San Dimas Water Company has applied to the commission for authority to sell $15,000 bonds for the acquisition of property and the development of new wells.

SAN DIEGO, CAL.—The city council has passed an ordidance calling a water bond election for December 30th. The amount to be voted is $705,000, $645,000 for improvements to the impounding system, and $60,000 for a filter plant.

EUREKA, CAL.—A resolution petitioning the state railroad commission to appraise the holdings of the Eureka Water Company, has been adopted by the city council. The desired appraisal is preliminary to submitting the question of purchasing the plant to the voters.

SAN FRANCISCO, CAL.—The Spring Valley Water Company has filed an application with the railroad commission for authority to issue $1,000,000 of 2-year collateral trust gold notes to bear interest at 5½ per cent. The company also asks for authority to pledge as collateral security for these notes its 4 per cent bonds in the sum of $1,334,000. The application states that the company expects to realize from the sale of its notes $980,000 and proposes to use the proceeds to pay off existing floating indebtedness. This floating indebtedness is represented by notes of the total of $975,000, held by San Francisco banks. The application also states that $5000 of this sum will be used in payment for work upon the Calaveras dam in Alameda county.

SACRAMENTO, CAL.—A. L. Shinn, representing the Mt. Shasta Aqueduct Company has presented a tentative proposal to furnish the city with McCloud River water. Shinn's proposition, which he says will assume definite form very soon in a proposal to the city commission, is summed up as follows: "The city of Sacramento by entering into a binding contract with us to take a minimum of 30,000,000 gallons daily can be provided with water at a cost of about half of what San Francisco is now paying. The water is not stored water. It has a 3 per cent hardness as compared with a 58 per cent hardness for the Sacramento River water. The water will be delivered under pressure to the distributing mains of Sacramento in a re-inforced concrete aqueduct channel. The proposition is to capitalize the project and give Sacramento practically a lease and option, the supply and the aqueduct, to be turned over to the city free at the expiration of a period in which the capitalization plus interest shall be paid in rentals."